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THIS JOURNAL *is non-political and seeks only to further the pursuit of knowledge. The main purpose is to communicate to scholars abroad the results of scientific investigations of the Near East as carried out in Israel. But as fruitful work can be accomplished only by reciprocal endeavour, papers from contributors in other countries will be gladly considered. The subjects to be dealt with include: the history, archaeology and culture of the countries of the Middle East, as well as their geography and natural features.—The Editors are not responsible for the opinions expressed by contributors.*

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Israel Exploration Journal

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The Excavations at Tell Qasîle

Preliminary Report

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In a first preliminary report[1] on the archaeological work at Tell Qasîle a brief resumé was given covering the progress of the excavations and its results during the first two seasons, up to 4 August, 1949. The second season was concluded at the end of September, 1949.[2]

1. TELL QASÎLE AND THE WATERS OF THE YARKON

Tell Qasîle lies within the borders of Tel Aviv north of the Yarkon at a distance of 250 metres from the river. (p. 80, fig. 1). The early settlement was built on a solitary hill on the south-western edge of the Kurkar ridge, the summit of which near the village of Sheikh Muwannis rises to a height

[1] Maisler, B.: Excavations at Tell Qasîle. *Bull. Jew. Palest. Explor. Soc.*, 15, 1949, pp. 8-18, *(Hebrew)*.

[2] The author gratefully acknowledges the assistance of the senior members of his staff in preparing this report, viz. Messrs. I. Dunayewsky and J. Kaplan who prepared the plans, and Mrs. Trude Krakauer-Dothan who classified the pottery.

The Tel Aviv Municipality financed the whole work besides giving us every technical support. The writer finds it a pleasant duty to express his thanks to Mr. I. Rokach, Mayor of Tel Aviv, who never flagged in his constant help to the expedition's archaeological work; his thanks are also due to the various departments of the Municipality for their kind and useful assistance.

of 46.6 m. above the Mediterranean, whereas the summit of Tell Qasîle reaches a height of only 26 m. above sea level (the Government benchmark is at 26.15 m.).[3]

The single fact that, on the Kurkar ridge overlooking the plain of the Yarkon, there existed for many generations a good-sized and flourishing settlement, strengthens the assumption that the river constituted the main factor in the economics of the settlers: it would appear that, by using the waters of the Yarkon for irrigation, they were able to maintain a high standard of agriculture, as witnessed by the grain pits, silos, stores for wine and oil, and fruit presses which were found mainly in the strata of the Iron Age. It should also be mentioned that even in the lowest stratum (XII) farming tools, including many flint sickle-blades, were found in great numbers. Moreover we see from an archaeological conspectus of Tell Qasîle that, apart from farming, industries and exports were important factors in the life of the settlement. It is therefore reasonable to infer that the site was used at various times as a sheltered port on the north bank of the Yarkon similar to those found near the mouths or the deep waters of other streams of this country: thus ships sailing along the coast would make their way through the estuary of the Yarkon and anchor in the deep waters near Tell Qasîle, the more so as the sand banks in the estuary were, in those days, less numerous than they now are.[4] In view of this assumption

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[3] On the maps of the Palestine Exploration Fund (about 1875) the tell is marked as *Ruins* with no name to it, whereas in the maps of the Survey of Palestine it is called Al-Qasila or Al-Khirba, and on some maps both these names are entered; cf. Survey of Palestine, Topocadastral Map 1:20,000, sheet 13-16, Nov. 1944. On the strength of finding the name Al-Qasila on the map we decided to call our site Tell Qasîle, hoping however that in the course of time the historical name of the ancient settlement may be revealed. For a map of the mounds along the Yarkon river see p. 80.

[4] The identification of the River of the Rocks, a harbour for boats north of Jaffa (known to us through Skylax' description of the Palestinian coast; 4th century B.C.) with the lower course of the Yarkon River might be adopted as a hypothesis only. Another opinion has been suggested by Galling, K.: Die syrisch-palästinische Küste nach Pseudo Skylax. *Zeitschr. Deutsch. Paläst. Ver.*, 61, 1938, Ref. pp. 81, 90; he proposes to complete the missing sentence as follows: [Κροκοδείλων πόλις καὶ] ποταμὸς Τυρίων, Ἰόππη ... and identifies the River of the Rocks with the River of the Crocodiles (Nahr ez-Zerqa) at the mouth of which stands Tell el Malat (Crocodilonpolis in the Hellenistic sources).

one can understand the story told about the Cedar trees of the Lebanon, 'being brought in flotes by sea to Joppa' in the days of King Solomon and of Zerubbabel, Governor of Judah, to be forwarded from there to Jerusalem.[5] In the light of the archaeological discoveries at Tell Qasîle, the settlement must have reached a high standard of development in Early Iron Age III (10th century B. C.) and in the Persian Period, as well as in the two strata (IX and VI), in which remains of public buildings were found. It appears that the trees were brought 'in flotes' to the Yarkon to be unloaded on the northern, or Israel, bank of the river near Tell Qasîle, and then transported by land to Jerusalem.

Tell Qasîle does not stand alone in the lower valley of the Yarkon for it is one of many tells in the chain of ancient towns, villages and forts, the remains of which testify to a continuous occupation and cultural development in that region, which excelled in its fertility and in the abundance of its waters from the Neolithic to the Arab Period. Excavations have been undertaken at two of these tells by the Museum of Jewish Antiquities of the Hebrew University: one, Tell el Jerishe (sometimes called Napoleon's Hill), a large tell south of the Yarkon near the mouth of the Wadi Musrara, in which were found remains of a town of the Middle Bronze Age and up to the Early Iron Age;[6] and the other, Tell el Kudadi, a small mound north

[5] See 2 Chronicles ii, 16 and Ezra iii, 7.

[6] Cf. Sukenik, E.L.: Excavations in Palestine, 1933-4: Tell el Jerishe. *Quart. Dept. Antiq. Palest.*, 4, 1934, pp. 208-9.
The report on the excavations at Tell Jerishe has not yet been published. However, in comparing the pottery of both tells, one gets the impression that the uppermost stratum of Tell Jerishe is to be compared to stratum IX of Tell Qasîle—that is, the town was destroyed at the end of the Early Iron Age (end of the 10th century B.C.). If this assumption is correct, we might suggest the identification of the Tell with Gath Rimmon in Dan (Joshua xix, 44-46: '...Bnei Berak, Gath Rimmon and the waters of the Yarkon with the border against Jaffa'), which was in the time of David and Solomon a town of the Levites (Joshua xxi, 24; 1 Chronicles vi, 54), i.e. an administrative centre in the Wadi Musrara area, south of the Yarkon. Concerning the towns of the Levites see W. F. Albright in *L. Ginsburg Jubilee Volume*, 1945, p. 49 ff. It may well be that this is Gath *(Knt)* mentioned in the lists of the towns in Palestine of Thutmose III (No. 63) with Jaffa (No. 62) and Lod (No. 64), Ono (No. 65) and Aphek (No. 66). Up to now Gath Rimmon was identified with Tell Abu Zeitun, a small tell standing out east of Jerishe; see Abel, F. M.: *Géographie de la Palestine*, II, 1938, p. 327.

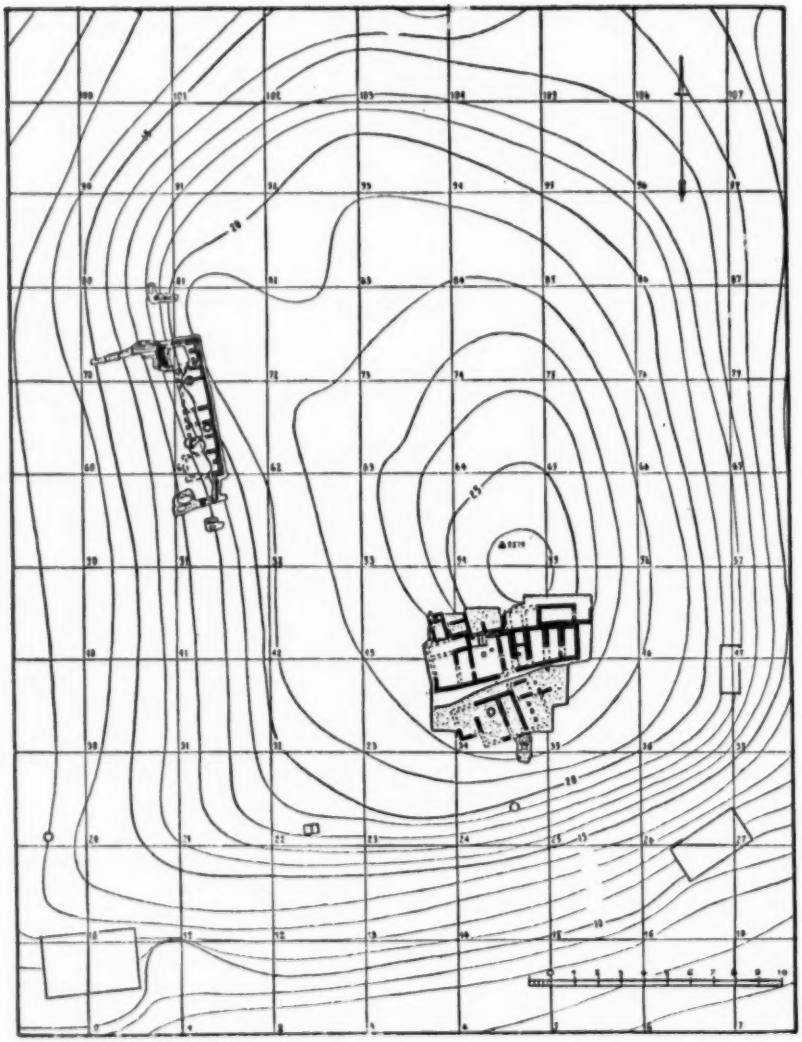

Fig. 1. Plan of Tell Qasile showing the excavated areas on the south and on the west of the tell. On the south of the tell are to be seen the outlines of the Iron Age buildings (dotted area—strata XI-X, the clear areas—stratum VII) and on its south end—the outline of the Roman pottery kiln. In the west are marked the remains of the Iron Age fortifications. Brick walls are shown in black.

of the Yarkon estuary, about 1750 m. from Tell Qasîle, where remains of a stronghold were revealed belonging to the Middle Iron Age (Kingdom of Israel). This stronghold kept watch over the mouth of the Yarkon, defending it against invaders and sea-robbers. Remains of the Persian and of the Romano-Byzantine Periods were also unearthed there.[7]

2. THE EXCAVATED AREAS AND THE BOUNDARIES OF TELL QASÎLE

In the first two seasons the expedition realised its main purpose: the methodical excavation of an area approximately one metric dunam in extent in the southern part of the tell—in squares 34 and 44, and partly also in squares 33, 35, 43 and 45[8]—in order to examine and clarify the character of the tell and to study the sequence of its strata (see fig. 1).

In the greater part of the excavated area all the strata of the settlement were examined from the surface down to the rock surface. Special care was devoted to the remains of structures built of Kurkar masonry and of sun-dried mud brick, and to the pottery. During the first season experimental trenches were dug at the foot of the tell and on its slope south of this area, in order to clear the ground for the dump. The investigation of the slope proved that no remains were preserved south of the contour line 22 m. above sea level; the only building found at this level was the Roman kiln for the firing of pottery (see fig. 1). As for the stone walls, their southern limit was at 22.5 m. (building U, in stratum XI). On the other hand, remains of sun-dried brick walls were found near contour 22 (building Q, strata XI and XII). These were covered only with a thin layer of earth. It is clear that any stone structure which might have stood south of the 22.5 m. contour had either been washed down the slope, or else

[7] Sukenik, E. L.: Excavations in Palestine and Trans-Jordan: Tell esh Shuni (Tell el Kudadi). *Quart. Dept. Antiq. Palest.*, 8, 1938, p. 167-8,

[8] The area of the tell was divided into squares of 20 x 20 metres. The zero line of the grid was fixed 105 m. south of the summit of the tell, and the squares were numbered from west to east, beginning with a line 90 m. west of the summit. These squares marked with Nos. 0—107 were subdivided into 16 small squares each, marked 1a, 1b, 1c, etc., measuring 5 x 5 metres each; cf. figs. 1 and 2. We put pegs in the ground marked with the numbers of the squares.

had been removed by man because it was visible above ground. It should be noted that when we began our excavations on 26 October, 1948, no remains of buildings could be seen, since the whole area had been completely cleared of stones by the local inhabitants. Under these circumstances we were unable, notwithstanding a thorough examination, to find remains of fortifications in this area and to fix the southern limit of the former settlement, although it seems evident that the settlement proper had never extented south beyond the 20 m. contour. Further south we unearthed two round pits cut in the Kurkar (in square 24) which contained pottery of the Iron Age, but these were outside the limit of the settlement, in the area in which the Kurkar rock stood revealed: they were similar to three Iron Age pits which were discovered west-south-west and south-west of the tell at a good distance from the extreme limits of the settlement (the three pits are marked by circles on fig. 1).

South-west of the tell the cellar with a mosaic floor adjoining it, which was discovered on the 18 m. contour (sq. 22), gives the extreme boundary of the Byzantine settlement — and apparently the older settlement had also reached that point. West of the cellar on the 12-13 m. contour two of the three pits mentioned above were found west of the tell. South of them, on the west side of the new house (marked in the general plan as a rectangle in sq. 0 etc.), Iron Age tombs were discovered cut in the Kurkar rock on the slope of the hill.

On the west side of the tell, in sqs. 61-71, an area of about 300 sq. m. was dug towards the end of the second season, under the supervision of P. Bar-Adon, a member of the expedition. A section of the inner face of the casemate wall more than 35 m. long was cleared together with its chambers: it belongs to the Israelite Period (strata VII-IX). As for the outer face of the casemate wall, it was found destroyed in this area, remains of stone structures being preserved here only up to the 19 m. contour and any other structure which had formerly existed west of that line having been washed down, or removed by man because it was visible. On the other hand, there were preserved in this area remains of earlier fortifications, made of brick and blocks of mud (terre pisée) the level of which is lower (strata

XI and XII); they also were preserved in sq. 70 and even near the 15 m. contour.

An experimental trench was dug north-west of the tell, and in the area about the 20 m. contour Iron Age remains were found. Evidently one should look for the continuation of the city wall beyond that line towards the north-west, and at some 19 m. above sea level. As for the east side of the tell, it stands to reason that one should look for the boundaries of the settlement on the 19 m. contour. The excavations on the tell as well as air photos (see Pl. 18) have allowed us to indicate the boundaries in general lines (see fig. 1). Its maximum length north to south is 150 m., its width 100-110 m. approximately. That is to say the ancient settlement at Tell Qasîle never exceeded 15-16 dunams in area, and was at times even more limited. Naturally, further excavations of the tell's boundaries might well throw new light on this matter.

3. STRATIFICATION OF THE SETTLEMENT

The excavations on the southern part of the tell have enabled us to distinguish twelve main strata, some of which are sub-divided into stages. Together they form a complete picture showing the cultural development and history of the site from the Early Iron Age to the Arab Period. All these periods are represented by remains of walls, floors, utensils and abundant pottery. The following is the table of the strata, beginning at the surface, as we have fixed them at the close of the second season:

I	Arab Period, including the Mamelukes.
II 1 II 2	Byzantine Period (4th—6th cent.).
III	Late Roman Period (3rd—4th cent.).
IV	Early Roman Period (Herod and his dynasty) 1st cent. B.C.—1st cent. A.D.
V	Hellenistic Period (3rd—1st cent. B.C.).
VI	Persian Period (Postexilic) 5th—4th cent. B.C.
VII 1 VII 2	Middle Iron Age II (House of Jehu and end of Kingdom of Israel), 8th cent. to 732. B.C.
VIII	Middle Iron Age I (House of Omri) 9th cent. B.C.

IX 1, IX 2 } Early Iron Age III (United Kingdom 10th cent. B.C.).

X Early Iron Age, IIb, (pre-Israelite Period in Tell Qasîle)—end of the 11th cent. and beginning of 10th cent. B.C.

XI, XII } Early Iron Age IIa, (Philistine Period)—end of 12th and 11th cent. B.C.

We began our first season with the removal in squares 33 and 44 of earth which contained glazed potsherds of the Mameluke period, as well as undecorated Arab pottery mixed with earlier sherds. It was only in the second season, after the removal of the surface earth in these squares that building A, belonging to the Arab Period, (stratum I) appeared. Under this stratum there was a large quantity of Byzantine pottery, and some poor remains of buildings began to emerge, left over from the two stages of the Byzantine Period (stratum II). They consisted of a wall and two pillars of Kurkar (building B, in stratum II, 1); and, at a lower level, a sitting bath with a floor and a pillar-base (stratum II, 2): these covered the foundations of a large building (building D) which must be attributed to an earlier period (stratum III). In Byzantine times the inhabitants removed the wall and pillars of this building, using them for the building which they themselves erected on the level ground. Building D, the foundations of which were revealed over an area of 400 sq. m., belongs, according to the pottery and the sequence of the strata, to the late Roman Period. The foundations of this public building caused great harm to the strata underneath; the foundation trenches for the walls and pillars had been dug down to about 24 m. above sea level, and in some places even as deep as 23.50 m., thus penetrating the Israelite strata. How great was the harm caused by the foundations of building D can be seen in the plan of the remains of strata VI (building G) and VII (J) in which the foundations of building D are marked by broken lines (fig. 2). This plan shows that the remains of stratum VII (late Israelite) were preserved only in the spaces between the foundations of building D.

Stratum IV is represented by the remains of Kurkar walls mainly in building E in the western part of the excavated area in the south of the

tell: these walls were not removed in later periods. The separate existence of this stratum (IV) is based upon the following facts: (a) The style of building E is Roman, but it differs from that of the building in stratum V (Herodian Period) and also from that of stratum III. (b) It is clear that in several places the foundations of the pillars of building D had destroyed the walls of building E. (c) It appears that when the erection of building E was begun the builders removed several walls belonging to building F (stratum V) and then levelled the ground.

In stratum V stone foundations were preserved as well as several remains of walls, a floor of hewn stones and a drain, all belonging to a public building (F) which occupied a considerable place in squares 43-45. Judging by the style of its construction, by its plan and by its pottery, this structure belongs to the Herodian Period and seems to have been in use for a long time. Building F is the oldest of the complex of the late structures unearthed on the south side of the tell which represent the new settlement founded in Herodian days (2nd half of the 1st cent. B.C.) upon the ruins of earlier date. It should be stated that in many parts of the excavated area we found occasional Hellenistic pottery. The foundations of building F stand upon the burnt remains of the Persian stratum (VI) and the late Israelite stratum (VII); on occasion they even penetrate into them.

Stratum VI is represented by remains of building (G) and outer court (G 6) in the western part of the excavated area on the south side of the tell (see fig. 2). The masons of this building removed all ruins of the former period (stratum VII) and levelled the ground of the outer court at about 24 m. above sea level, whereas the pavement of the structure itself (room G3) lies only at 23.80 m. On the other hand the débris of the ruins of stratum VII were preserved in the area east of the court G6 which was not occupied in the Persian Period. Here were uncovered a few remains of walls built of mud brick, as well as store rooms and various other remains belonging to stratum VII, all of which had not been destroyed by the foundations of building D. In this area we distinguished two stages belonging to stratum VII as witnessed by floors at two different levels, one at 24.55—24.65 m. (VII, 1), and the other at 24.25—24.35 m. (VII, 2) above sea level (see

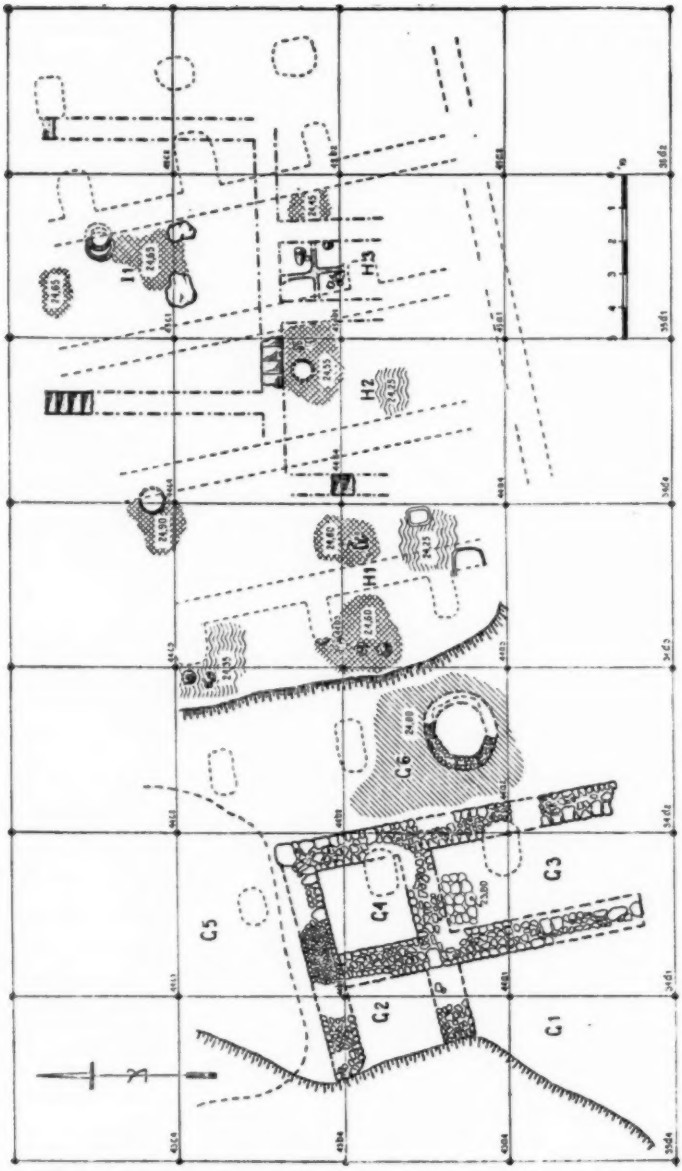

Fig. 2. Remains of structures, accumulations of pottery vessels, plants and floors of strata VII 1 and 2, (H and I) and VI (G). The plan of builiding D is marked with fine broken lines (stratum III). West of the remains of building G—the Roman fosse.

fig. 2). Below the remains of the building and the burnt layers of strata VI and VII we distinguished, in the area on the southern part of the tell, five strata of occupation belonging to the Iron Age; two Israelite (VIII and IX), one post-Philistine (X) and two Philistine (XI and XII). An interesting fact which became clear in the course of our excavation enabled us to understand the character and sequence of the strata, which had been built each on top of the ruins of its predecessor. That is to say, there had been a gradual contraction of the settlements' boundaries on the southern side of the tell. On the southern side of the excavated area two complexes of structures, U and Q, were uncovered, both belonging to strata XI and XII (sq. 34 a-c, see fig. 1) the remains of which were revealed in the south as far as the 22 m. contour. On the other hand we found the extreme southern wall in stratum X east of the excavated area, some 7 m. further to the north on the 23.17 m. contour (wall 110, sq. 34 C4). Following the destruction of the Israelite town the whole of that area became a field of ruins, nor was it ever rebuilt in the Israelite Period. This was the reason why it was impossible to carry out in that area a systematic investigation of the three strata X-XII, and to decide upon the relationship between them, without being compelled to remove the later accumulations belonging to the Iron Age, thus enabling us to distinguish between the pre-Israelite Period and the Israelite Period of Tell Qasîle. As for the Israelite strata VIII and IX, their boundary is indicated by a long wall (35 m.) built of Kurkar which limits the complex of buildings to the south. The wall extends west-south-west to east-north-east about 12 m., or even more, to the north of the extreme remains of the south structure of strata XI and XII (see fig. 1).

Strata VIII and IX have three structures, all of them forming one complex; they are, from west to east, J, K and the public building L (see fig. 1). In this group which is built upon the remains of earlier settlements we were able to ascertain the development of the buildings as well as the chambers occurring in their plans, and to distinguish between the different strata, thanks to a careful investigation of the structure, its burnt layers, its floors and its pottery, and even to distinguish between two different stages of stratum IX in the buildings J and K. A clear picture of the

sequence of strata in this area can be obtained through the levels and the floors as fixed at various points, such as:

	VIII	IX. 1	IX. 2	X	XI	XII & natural Rock Surface
Court of bldg. J	22.90	22.55	22.30	21.93	21.80	21.68—21.27
Court of bldg. K	23.70	23.40	22.80 (& 22.60)	22.40	21.90	21.80 approx.
Bldg. L, room 8	24.00	23.35	—	23.20	23.18	23.10—22.73

In our attempt to fix the levels of the floors of the different stages of the settlement, we were greatly helped by the examination made of the ovens in the courtyards of the houses. Thus for example we found in the yard of house K four ovens, one above the other, the uppermost belonging to stratum VIII (the height of its base being at 23.72 m.); the next one below it, to stratum IX, 1 (23.40 m.) and the two lowest to stratum IX, 2 (22.81 m. and 22.61 m.). The ovens in addition to certain other implements are evidence of domestic installations in the Israelite Period at Tell Qasîle. The appreciable differences between the levels of the floors of the three buildings mentioned above can be explained by the fact that previous to the occupation of Tell Qasîle the summit of the natural hill lay to the east of the excavated area, with the surface sloping down to the west and south. Owing to the irregular increase in the depth of the accumulated débris, considerable changes occurred in the topography of the site. To illustrate this fact the following table is given, showing the absolute heights in a line of squares from east to west (see fig. 1).

Square	Average level of rock	Average level of ground surface before excavation
45b2	23.50 m.	25.00 m.
45b1	23.00	25.50
44b4	22.50	25.75
44b1	21.40	25.00
43b4	21.00	24.50

By comparison with the archaeological features observed in the south of the tell, we were able to distinguish between the different strata of the Iron Age found in the fortification area on the west. It thus appears that the remains of the Kurkar structure found in this area are nothing more than a casemate wall erected at a period corresponding to stratum IX in the south of the tell, and that it has been rebuilt twice during the periods corresponding to strata VIII and VII in the south of the tell. From this evidence one may assume that this complex of fortifications underwent various developments and repairs from the time of its first construction at the beginning of the Israelite Period, in the tenth century, until it reached its final form at the close of the period in the eighth century B.C. The casemate wall was built on the ruins of a complex of fortifications of mud-brick which corresponds, according to its pottery, to stratum XI; blocks of terre pisée, however, which have been found in the south of the excavated area on the west of the tell correspond, apparently, to a system of fortifications from the time of stratum XII in the south of the tell. The fact that in the fortified area in the west of the tell no traces corresponding to stratum X have been found is rather startling, and one may assume that during this period the occupied area did not extent so far to the west.

4. THE PHILISTINE PERIOD (STRATA XII AND XI)

A survey of the remains of the oldest settlements in Tell Qasîle enabled us to distinguish between two strata, XI and XII, each having a complex of buildings in the south of the tell and remains of fortification on its western side; there is a burnt layer between them. These strata are distinguished by their Philistine pottery and other objects typical of the Early Iron Age II, whereas earlier pottery, of the Late Bronze Age, and even of the Early Iron Age was not found at all at Tell Qasîle. This definitely fixes the date for the foundation of the settlement as being after the middle of the 12th century B.C.

In the first two seasons few remains of structures were unearthed, standing on the natural rock and belonging to stratum XII: these were mainly walls of sun-dried mud bricks on the south-west side of the excavated

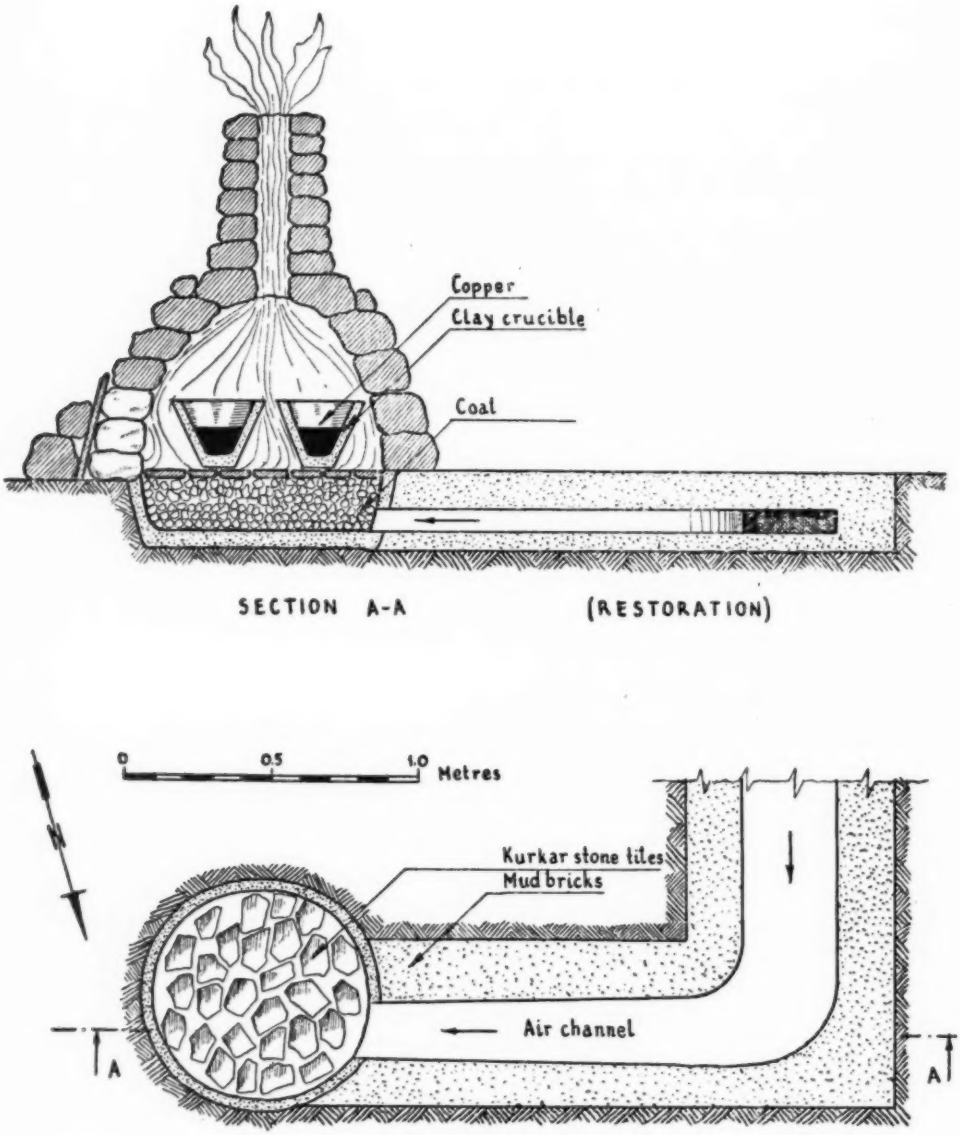

Fig. 3. Smelting furnace (Stratum XI).
Below: Plan of furnace and air channel. Above: Section (restored).

area, south of the tell. In square 34b1—34b3 there were traces of the outline of the rectangular building (Q 11), its breadth being 5.5 m. and its length 12.3 m. at least. In other places we came across traces of walls, stone pavements, ovens, silos, and holes cut in the rock, as well as a thin layer of earth and ashes which contained bones of animals, pottery, and flint tools.

At that time the settlement seems to have spread all over the hill as far down as the slopes, as is proved by the accumulations on the southern edge of the tell, and by the few remains of a city wall built of blocks of terre pisée reaching down to virgin soil and discovered on the west side of the tell (square 51c2). It is clear however that the buildings were widely spread. It is worth noting that stratum XII was rich in stone mills (mainly upper mill-stones), flint blades, hand sickles and pottery.

In contrast to stratum XII, stratum XI produced substantial remains of buildings. Of special interest are the two buildings situated on the southern edge of the excavated area which form one complex, namely Q6-8 in square 34, and U, east of it, in squares 34 and 35 (see fig. 1). Usually the foundations are of undressed Kurkar stones somewhat sunk in the ground, and these are surmounted by walls of mud brick; but on occasion one finds a wall built entirely of mud brick without foundation, standing directly on levelled ground. It should be mentioned that the occurence of both of these types of wall close together is typical of the building at Tell Qasîle during the Early and Middle Iron Age.

As for building Q, it must have been used as a smelting plant: in the spacious room Q8 two furnaces were found, one on the western side which had a flue built of bricks going down under the western wall of the room and turning south (see plan and section in fig. 3): the other was on the same side, also with a flue turning south. It appears that two smelting furnaces existed in this area in the next period (stratum X) also: nearby we found two clay crucibles containing remains of smelted copper.[9]

East of room Q8 a paved court was found in which there was a granary

[9] The Early Iron Age smelting furnaces found at Tell Jemmeh (Flinders Petrie: *Gerar*. London, 1928, Pl. VI), resemble the plants found at Tell Qasîle.

built of small Kurkar stones which continued to be used in the following period (stratum X), and east of this court we found the remains of building U. As far as we were able to ascertain, the plan of this building (see fig. 1), consisted of a long narrow court (U 1) and two rooms east of it: a square one in the south (U 2) and an oblong one in the north (U 3). Of special interest is the room U 2 (its width 5.5 m. and its length 6.5 m. at least). It was divided into two parts by a row of pillars built of partly burnt brick, on stone foundations. Three of these foundations with a heap of fallen bricks upon them, were found preserved on the spot.[10] The pillars were probably used for the support of the roof. One half of the room west of the pillars was paved with Kurkar slabs, and on the floor there were stone and pottery utensils, among which were 'loom weights', a 'spinning bowl' and a lamp. In that room there is an opening into room U 3 and on its east side there is a feature the use of which is not yet clear: it consists of two ovens covered with potsherds on the outside, and between them there is a sort of drain cut in the rock, with a pierced stone nearby (Pl. 19, B). Another complex of structures belonging to stratum XI was unearthed in the west of the excavated area on the south side of the tell. One of the buildings (ca. 9.75 × 10.50 m.) contains a spacious court (J 13) with an oven and one single rectangular room (J 14). In another room, in the northwest corner of the court (O5), a heap of stones was found the diameter of which was 1.50 m. This had not been removed even in the following period, presumably because it served as a cult object. In the remaining parts of the excavated area on the south of the tell, only remains of walls, floors, silos and accumulations were found. They contained a great deal of pottery and various objects of flint, bone and copper.

(To be continued)

[10] Rows of pillars, typical of Israelite houses, were found in the Middle Iron Age of Tell Beit Mirsim; see: Albright, W. F.: The Excavation of Tell Beit Mirsim. III. *Ann. Amer. Schools Orient. Res.*, 21-22, 1943, p. 50 ff. To this day, however, no earlier specimens have been found, except the building at Tell es Safi (called 'high place' by the excavators), belonging to the Late Bronze Age according to the descriptions of the excavators; see: Bliss, F. J. & Macalister, R. A. S.: *Excavations in Palestine during the years 1898-1900*. London, 1902, p. 31-2, fig. 9. Compare also Judges xvi, 25-29.

The Geological History of the Yarkon Valley and its Influence on Ancient Settlements

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THIS paper deals with the main geological problems of the Yarkon valley in connection with the archaeological excavations carried out at Tell Qasîle, north of Tel-Aviv.

THE GEOLOGICAL STRUCTURE OF TELL QASÎLE

Tell Qasîle is entirely composed of the so-called Kurkar sandstone, which is common in the whole Coastal Plain of Israel and usually forms ridges running north and south, which sometimes attain a height of 100 m. above sea-level. The Kurkar is a continental, aeolian formation of sand deposited at various stages of the Pleistocene ('Diluvium'), and similar to the sand which accumulates to-day in some areas of the Coastal Plain (for instance in the region of Caesarea). During some stages of the Pleistocene the accumulation of sand was on a much greater scale than to-day. Gradually, under suitable conditions, the grains of sand were consolidated, mainly by calcium carbonate which permeated it.

The earliest stratum at Tell Qasîle was built directly on the Kurkar rock, and stones of Kurkar were used in the construction of this and of several subsequent building periods. Kurkar is very easy to quarry and to dress even with primitive tools.

GENERAL TOPOGRAPHY

Tell Qasîle lies on the south-western end of a Kurkar ridge whose length is about 4 km. Close to its summit (46.6 m) is situated the village of Sheikh Muwannis, and Tell Qasîle itself lies at about 26 m.

The valley of the Yarkon lies at the southern foot of the Tell. This river, in its numerous wanderings, has dug quite a broad and deep valley (near Tell Qasîle its width reaches about 600 m.). The valley is filled with silt and fine loam, which was brought here from around the sources of the river and from the area along its course. At the foot of Tell Qasîle the river-silt extends up to 8 m. above sea level. This shows that the waters of the river used to reach a similar height in the past. These 8-metre alluvial deposits are found within a little more than one km. of the sea, a height now well above the flood plain of the river; hence it is clear that the past geological conditions were different from those of to-day.

The Tell is bordered by two small wadis on the east and west. The eastern, which is nameless, is no more than 450 m. long; the western is about 5 km. long and bears two names, Wadi en Nimr in its southern part and Wadi el Marj in its northern part. As a result of winter rains and disintegration, a soil deposit containing fragments of Kurkar has accumulated in both wadis and quantitatively appears to be directly related to the size of each. Wadi en Nimr is the western boundary of the Sheikh Muwannis ridge, and carried a road from the Yarkon to the north in ancient times; the main highway from Tel-Aviv to Haifa has recently been built along it. Thus the Tell Qasîle settlement was situated where road and river crossed, i.e., at the junction of two lines of communication.

THE GEOLOGICAL PROBLEMS PERTAINING TO THE HISTORY OF THE YARKON VALLEY

Some geomorphological and geological problems connected with the archaeological problems of Tell Qasîle should be mentioned here.

No doubt the different settlements which existed at various periods were dependent on the Yarkon, and the question arises as to whether the Yarkon of former days was the same as to-day. This has its bearing not

only on Tell Qasîle but on all other settlements along the banks of the Yarkon, such as Tell el Qudadi (the fortress at the mouth of the Yarkon near the bridge of the Reading Power Station), the settlement on the Kurkar ridge near the Tel-Aviv slaughter-house, and the Tell Jerishe settlement. All these settlements are situated on the edges of Kurkar ridges which have been cut through by the Yarkon and its tributaries. The topography of the Yarkon valley and the distribution of the loam mark the limits of the wanderings of the river, but we still lack sufficient data to present an exact chronology of these wanderings. There is no need to stress the interest attaching to the elucidation of this problem.

In order to explain it, it is necessary to understand the possible causes of river wanderings. One of these causes lies in the mere existence of the river. Its erosive-destructive action and its accumulative-building power lead to constant changes of the river-bed. The climatic changes, even the usual seasonal and periodic changes, could increase or diminish the quantity of water flowing in the river and thereby change both its destructive and constructive activities. The alterations in heights and form of the land-surface present another cause of the river-bed changes. All these processes had an indisputable influence on the life of man as well as on the history of his settlements.

THE WANDERINGS OF THE YARKON

Comparing the width of the Yarkon bed of to-day, which varies from 40 to 60 m. near Tell Qasîle, with the width of its valley, which is between 400-600 m., we can conclude that the wanderings of the river were quite extensive. Even the length of the Yarkon was subject to changes depending on the changes of the sea-shore. In a paper dealing with the recent geological history of the Coastal Plain north of Acre[1] I described the fluctuation of the sea-shore at various stages of the Pleistocene, through a period of tens and hundreds of thousands of years; in the Palaeolithic period the sea-shore was situated several km. westward from that of to-day. The

[1] Contribution to the Geological History of the Palestinian Coastal Plain: Nahariya and its Vicinity. *Bull. Jew. Palest. Explor. Soc.*, 10, 1943. pp. 39-46. (Hebrew).

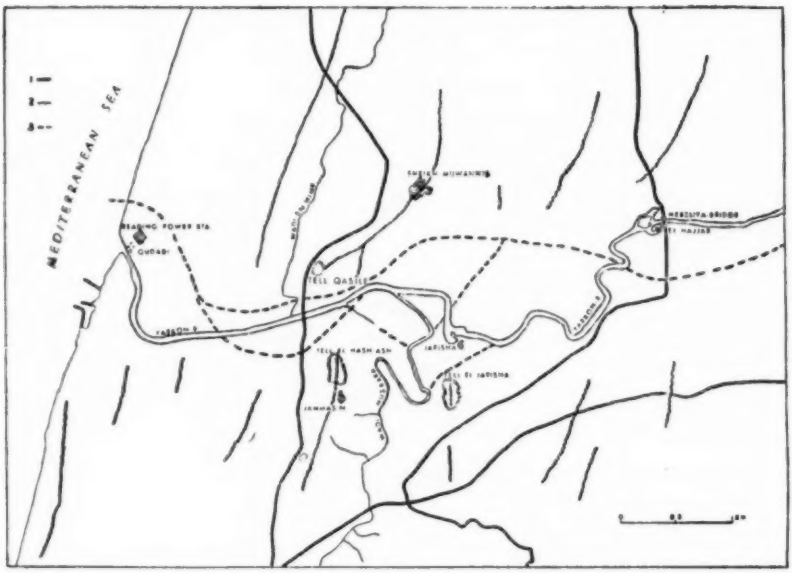

Fig. 1. Map of the course of the River Yarkon.

1: Kurkar ridges which have been cut through by the river. 2: Major roads.
3: Major ancient courses of the Yarkon and Musrara rivers.

present shore of Tel-Aviv also shows signs of recent oscillations of sea-level.

Not only the Yarkon itself but its tributaries as well were subject to the same influences, so that the morphology of the valley became quite complex, e.g. Tell Jerishe is under the influence of both the Yarkon and Wadi Musrara and both have contributed to its present shape.

The two natural dams (exploited in modern times), one near the Herzlia bridge (el Haddar) and the other near Jerishe, are witness to the fact that it is only recently that the river has occupied this part of its valley and thus the river-bed is only excavated to a small depth. Formerly the Yarkon flowed about half a km. southward from the Herzlia bridge, at the foot of the Kurkar hummocks, nearly corresponding to the position of the present railway. From there it ran in a wide bow to the north-west at the foot of

the south-east side of the Sheikh Muwannis ridge. In passing Tell Qasîle it flows westward (see fig. 1.). At the same time Wadi Musrara pushed through between Tell Jerishe and the former Jerishe village towards the north-east where it joins the Yarkon. For reasons not sufficiently clear the Yarkon has little by little assumed its present position and probably the same causes have influenced the location of Wadi Musrara. As a result of these wanderings, the wide plain, today covered by orange groves, between the bow of the Yarkon from the Herzlia bridge to Sheikh Muwannis ridge, was formed.

In those times the sea-shore was farther west, and the bend south-east of the Yarkon mouth was farther east; the river flowed to the north-west, over the plain, occupied to-day by the landing-ground. North of the Reading Power Station it turned west, continuing its way over an area west of the present shore-line.

EVIDENCE OF SHORE-LINE CHANGES

Changes of the shore-line are evidenced by the position of Kurkar deposits, the position of the brown sandy loam layers or 'Hamra', and the position of young marine sandstone exposed on the sea-shore south of the mouth of the Yarkon.

The Kurkar, as a Pleistocene aeolian formation, could only develop on the surface above sea-level. But on the shore, from the hummock of the Moslem cemetery to the port (see figs. 1 & 2 and Plate 20, A), the

Fig. 2. Cross-section of the coast (W to E) south of Tel-Aviv harbour.

a: Lower Kurkar (Palaeolithic). b: Lower Hamra Sand (Upper Palaeolithic). c: Upper Kurkar (Mesolithic and younger). d: Upper Hamra Sand (Protohistoric and younger). e: Beds of marine sandstone (Post-Palaeolithic). f: Recent coastal sand.

Kurkar layers deepen below the sea-level. This fact is known from the many borings in the Coastal Plain, which show that Kurkar layers extend

50 m. and more below sea-level. Thus, from the time of the formation of the Kurkar until the present day, the surface has sunk at least 50 m. in relation to present sea-level.

An even more important proof is found in the deposits of brown sandy-loamy soil (the sandy Hamra), which is found together with the Kurkar all over the Coastal Plain. Such a Hamra deposit is seen on the steep beach-range about 150-200 m. south of the port-fence. The Hamra is a typical continental deposit, representing a soil formation of former days. Very often flint splinters and flint implements are found in it, evidence of prehistoric man at the time of the creation of the Hamra. Dr. Stekelis, who has kindly examined these flints, has stated that a small number of implements were found among the numerous splinters. One splinter shows the mechanical effects of fire, possibly originating from a nearby hidden prehistoric fireplace or a dwelling. It is to be supposed that this stone industry belongs to the Upper Palaeolithic or at least to the Lower Mesolithic, although the typical microliths are missing here. A deposit with similar implements was found by Dr. Stekelis in the 'Athlit quarries in 1940.

These finds again prove a relative subsidence of the surface after the Upper Palaeolithic or after the Lower Mesolithic, during the last 30-50 thousand years.

The Palaeolithic deposit is enclosed between two Kurkar layers. The upper Kurkar is covered again by a Hamra of Neolithic to Arab age. This younger Hamra is often separated by several layers of intervening Kurkar horizons of very recent formation.

A different formation is visible on the sea-shore. There, near the port-fence, thin regular banks of marine, conglomeratic sandstone, occur dipping 5^0 westward. These banks are in clear discordance with the Palaeolithic Kurkar. The position of the marine banks suggests that they were due to small and very young faulting, hidden on the sea bottom, not far from the shore. This relative elevation connected with faulting may be observed in other parts of the shore (e. g. at Acre), but it is very limited in range, with a maximum elevation of 3 m.

All these facts prove that there was a relative subsidence of the surface after the Palaeolithic. The process of subsidence took quite a long time and reached a considerable depth. The uplift, probably Neolithic, which has recently been observed, was less effective. Both these events, which were almost continuous, accordingly influenced the fluviatile regime in the region, changing the rate of its erosion, the amount of its accumulation, and the sculpturing of the valleys. Thus the vertical and horizontal changes of the coastal line contributed to the development of the Yarkon valley system. These changes continued with varying tempo during prehistoric, protohistoric and historic times and undoubtedly had a great influence on the history of man in this region.

Five Lamps with Fish Reliefs

From Israel and Other Mediterranean Countries

MIRIAM SCHAAR SCHLOESSINGER

ALTHOUGH many lamps bearing fish reliefs or moulded in the form of fish have been recorded, the five lamps here described appear not to have been published. It is often difficult to determine conclusively that symbolism is indicated when the fish is found on ancient monuments or artifacts. The fish on the lamps of Palestine and the Mediterranean countries form a very controversial subject, as it is not always possible to differentiate the pagan use of the fish from the Christian use of it as a symbol of ΙΧΘΥΣ.

LAMPS[1]

Lamp A: Plate 21, B, C.
L. 10.0 W. 1.5 H. 6.5 (cm).
Provenance — Egypt (?); bought in Constantinople. Date — 1st cent. B.C.[2] *to 1st. and 2nd centuries* A.D.[3]
Reddish-brown clay, slightly discoloured in baking.
Potter's mark Α Μ Α *(Plate: 21, C).*

Lamp A is a zoomorphic lamp modelled in the form of a fish. It belongs to that class of lamps which the British Museum catalogue groups under 'Roman clay lamps modelled in various forms.'[4]

Our fish differs from all the species of fish on fish-lamps or reliefs of fish in the exhaustive material of Doelger[5] but it is very similar in shape

[1] The lamps published in this paper are from the collection of the author.
[2] Brants, J.: *Antike Terra-cotta Lampen.* Rijksmuseum van Oudheden te Leiden. 1913.
[3] Walters, H. B.: *Catalogue of Lamps in the British Museum.* London, 1914, p. xxiii.
[4] *ibid.*, Pl. XII, and Pl. XI. for those from Egypt. Cf. especially No. 435.
[5] Doelger, F. J.: *Die Fisch-Denkmäler in der frühchristlichen Plastik, Malerei und Kleinkunst.*

to a fish he has copied from an Egyptian tomb painting, which he states to be Tilapia Nilotica.[6] As that fish was part of a catch from Egyptian waters (the Nile?) it may permit us to accept the provenance of lamp A as Egypt, basing the assumption on the superficial similarity of the two fish.[7] The palm leaf on the base is similar to several which were found on Roman Ehnasya lamps as potter's marks, (cf. W. M. Flinders Petrie, *Roman Ehnasya,* Pl. lxxiii). Amongst the Egyptian lamps with potter's marks, which were available for study, no parallel was found for the inscription AMA.

If the dating of the zoomorphic lamps in general is accepted as of the 1st century B.C. to the 1st and 2nd centuries A.D., it would be of interest to establish definitely whether such lamps were made as a form of genre art or whether in certain cases, as for instance in the case of the fish, a deeper significance should be attached to their manufacture—i.e. a symbolic significance—even though there be no concrete evidence to permit such an assumption. As Doelger says: 'It is very easy to discover symbols in almost any decorative motif'. For that reason he is inclined to approach articles of mass production such as lamps, especially, with skepticism when Christian symbolism is suggested. A forced insistence on symbolism can disturb quiet, honest research, but at the same time exaggerated skepticism can lead one into serious errors.[8] The antique world attributed to the fish the power to ward off evil. It was also a fecundity and life symbol.[9] An early Roman lamp from the collection of H. Wollman bears a relief of an altar, two roosters and a fish,[10] all pointing to a sacrifice to the gods of the underworld and the dead.[11] It is just possible that if that lamp were not unmistakably of an early Roman period, i.e., ca. 1st century B.C.—

Münster, 1927 (Plates). id. ΙΧΘΥΣ—*Der heilige Fisch in den antiken Religionen und im Christentum.* Vol. III, 1922, and Vol. V, 1937.

[6] Doelger, F. J.: ΙΧΘΥΣ. Vol. III, Pl. 8—'Fisch-Fang im Grabe der Ti'.

[7] I am indebted to the Department of Fish of the American Museum of Natural History, New York City, for the reference to Boulanger, G. A.: *Catalogue of the Fresh Water Fish of Africa,* (4 vols.), 1909-1916, Vol. III, pp. 162-3 and Fig. p. 106: *Tilapia Nilotica,* and for permission to say that lamp A might be considered an artist's stylized attempt to reproduce Tilapia Nilotica.

[8] Doelger, *op. cit.,* (supra, n. 6), p. 404.

[9] *ibid.:* p. 405. [10] *ibid.:* Pl. 38, No. 755. [11] *ibid.:* p. 404.

1st A.D.,[12] it might very convincingly have been demonstrated to have Christian significance.

Lamp A is apparently a late example of its class and could be claimed to be symbolic both from the Christian and pagan points of view. It may too, however, be only the expression of an artist's delight in portraying the beauties of nature with which he is familiar. It does not seem justified in this case, where there are none of the accepted Christian symbols (such as the Cross, Chrisma, Anchor, etc.)[13] to consider this fish-lamp as Christian, even though a lamp modelled in the shape of a fish and also *without* Christian symbols has been classified as a Christian lamp in the Vatican Museum collection.[14]

Fish have been used by many ancient peoples decoratively or symbolically as far back as the Magdalenian culture.[15] Babylonians, Assyrians, Persians, Egyptians, Canaanites, Greeks, Romans and many others looked upon the fish as luck-bringers[16] and at times attributed to the fish the potent virtues of their highest gods and goddesses. Even today, fish as amulets are worn throughout the Near East. While pagan symbolism may not be completely disregarded as a possibility in Lamp A, its lack of any other symbols of a pagan cult make it appear more probable that the fish here is simply an expression of the general culture of the period.

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Lamp B: Plate 22.
L. 15.5 W. 7.5 H. 3 (cm).
Provenance—Jerusalem, acquired 1935 or 1936, together with lamp C. (Said to have been found together in an unrifled tomb at Walaja, a village near Betther on the railway to Jerusalem).

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[12] Walters, *op. cit.* (supra, n. 3), Introduction, p. xxii for dating. Nos. 513-518 and figs. 95-97 for type. Brants, *op. cit* (supra, n. 2), Soort VI, pp. 13-14, Pl. I-147, for dating.

[13] Broneer, O.: *Corinth.* (Vol. IV, 2). *Terracotta Lamps.* Cambridge, Mass., 1930.

[14] Doelger, *op. cit.* (supra, n. 5), Vol. III, Pl. 86, 1.

[15] *ibid.:* Pl. 103.

[16] Sheftelowitz, I.: Das Fisch-Symbol im Judentum und Christentum. *Archiv f. Religionswiss.*, 14, 1911, pp. 368-9. See also Inman, Th.: *Ancient Pagan and Modern Christian Symbolism*, pp. 1-4, 32, 68; Delattre, R. P.: *Lampes chrétiennes de Carthage.* Lyon, 1880, pp. 1-4. Achelis, H.: *Das Symbol des Fisches,* and Eisler, R.: *Orpheus the Fisher* offer additional information on the subject.

Date—2nd to 3rd centuries A.D. *(The type is now considered to have been in vogue at that time).*[17]

Fine-textured light buff clay with pinkish-yellow tinge and remains of thin dark paint (?).

This unusually fine lamp—a polycandelon with five wickholes, slightly smoked—is in perfect condition and would be of interest even if it did not bear the well-moulded reliefs of two fish on its upper surface. It differs in design and decoration from all the published examples from Gezer[18] and from the very interesting polycandelon with arcade relief and two objects which may be fish, from Tell en Nasbeh,[19] as well as from all other square-nozzled lamps with multiple wickholes thus far encountered in the collections of the museums and universities in the eastern states of North America. While it appears to be unique at the present writing, it is closely related to many polycandelons of this type. The bottom shows 4 longitudinal grooves between 5 channels for the wicks, which extend from the nozzle-end towards the base-ring. The base consists of 5 concentric circles in relief with a central pellet.

The reliefs on lamps of this type are occasionally purely decorative (as for example, a lamp from Gezer; Vol. III, pl. 77, No. 15), but in many of these polycandelons the reliefs are such that there can be little doubt that they are symbolic of one or other of the forms of worship of that time. It is however often difficult to determine just which form of worship is being symbolized. The temple-arcades on some lamps (*Gezer* III, Plate 101[a]-16,17), the strange upright object under an arch on another (*Gezer* III, Plate 77-17, 18), sepulchral or wedding vases (loutrophores),[20] trees

[17] Iliffe, J. H.: A Tomb at el Bassa of c. A.D. 369. *Quart. Dept. Antiq. Palest.*, 3, 1934, p. 84.

[18] Macalister, R. A. S.: *The Excavations of Gezer.* London, 1912. Vol. III, Pl. 101 (a) Nos. 16, 20, from tomb 36, and Pl. 79, Nos. 15, 19, from tomb 228.

[19] Avi-Yonah, M.: Oriental Elements in the Att of Palestine in the Roman and Byzantine Periods. *Quart. Dept. Antiq. Palest.*, 10, 1942, pp. 143-145, Pl. 29, No. 11. The reliefs under the two center arches on that polycandelon appear to be fishes, while reliefs of lozenges appear to be under the outer arches. Avi-Yonah says that perhaps the fishes are symbols connected with the Atargatis cult. Cf. n. 35 *infra* Doelger for lozenge symbolism: 'Die Raute'; and also Lajard, *ib.*

[20] Richter, G. M. A.: *Attic Red-Figured Vases.* New Haven, 1946, p. 13, fig. 2.

under arches,[21] amphorae with grapes,[22] and fish—especially fish—(Delattre, *op. cit.*, n. 16, [p. 15]) are motifs which could be variously interpreted as symbols of Jewish, Christian or Pagan cults.

The two large-bellied fish on lamp B (Plate 22) lie parallel to each other with heads to front and fins to left. A prominent figure consisting of three concentric ovals in relief lies directly in front of each head.[23] The question immediately arises as to whether these fish and concentric ovals together or individually are symbols or whether they are simply a decorative device to fill the space. If it were only a matter of decoration, the discerning eye of the designer of this lamp would surely have seen that he could have achieved a greater artistic effect—one more in keeping with the classic pattern of the infundibulum—if he had omitted such incongruous objects. It would seem as if the idea of a decorative effect could be dismissed and planned symbolism accepted in its stead. Could the two fish here shown, then be symbols of ΙΧΘΥΣ and if so, might not the concentric ovals represent the loaves? Attractive as this idea appeared to be when the lamp was acquired, it had to be discarded. At that time lamps of this type were still considered to be of the 5th century A.D. or later, but the present (possibly not yet final) dating of the type by Iliffe to the 2nd to 3rd century[24] would make our lamp too early (as far as is known) to bear this type of Christian iconography. But even though the dating be disregarded, the suggestion that the ovals represent the loaves is only possible by a great stretch of the imagination and without the aid of any comparable parallel. The fish alone cannot be looked upon as a Christian symbol, as they are unaccompanied by any other *accepted* Christian emblem to identify them as ΙΧΘΥΣ.

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[21] Avi-Yonah, *op. cit.* (supra, n. 19), p. 141.

[22] Macalister, *op. cit.* (supra, n. 18), Pl. 77, No. 19; Avi-Yonah, *op. cit.*, pp. 145-6, refers to the symbolic significance of the vase-motif on another polycandelon from Tell en Nasbeh and recalls its resemblance to the vases on Jewish coins. McCown, C.C.: *Tell en-Nasbeh*. I. Berkeley & New Haven, 1947, Pl. 42, No. 18. See also Brants, *op. cit.* (supra, n. 2), pl. 7, Nos. 1060-1061.

[23] Fish and 'rhomb' (lozenge, concentric pointed ovals) are found together on a number of Neo-Assyrian cylinder seals. See *Corpus of Ancient Near-Eastern Seals*, Vol. I (in press), 707, 709, 712. Porada, E.: *Mesopotamian Art in Cylinder Seals of the Pierpont Morgan Library*. New York, 1947, No. 80.

[24] Iliffe, *op. cit.* (supra, n. 17).

Lamp B is well conceived and well executed. It appears to be the handiwork of an artist or of a potter who was familiar with the finer lamps of Greece and Rome. He has used his skill and knowledge on a distinctively Palestinian form of polycandelon by combining it with certain features of the lamps of classic times, as the concave rayed discus around the filling-hole,[25] the continuous double spirals,[26] the grooved ring-handle[27] with central herring-bone[28] and an extended modification of the volute (i.e., a quasi-volute). This rather elegant, high-grade lamp seems closer to the Roman or Pagan prototypes of luxury-lighting than to the simplicity of the Christian standard of life in Palestine, if the many later lamps with unmistakable Christian symbols or inscriptions[29] can be used as an economic gauge of the Christian demands on life in Palestine in the early centuries of the Christian era. These are factors which strengthen the assumption that we are dealing with a pagan rather than a Christian lamp.

The fish and the concentric ovals are placed in the most conspicuous spot on the lamp, evidently to draw attention to some faith or belief in the potency of the fish as a symbol. It is suggested that the two fish represent Atargatis, 'the great, ubiquitous, international goddess of procreation and fertility', whose cult had captured so many of the Hellenized Semites and their conquerors throughout the Roman empire under one of her different names and manifestations.[30] As the 'fish goddess' of Ascalon,[31] her cult would easily spread to the surrounding country — to Gaza, its nearest neighbour, the greatest trading-center of ancient Palestine and by caravan trade-routes from Gaza through the desert areas to the East and South.[32]

[25] Broneer, *op. cit.* (supra, n. 13), pl. 7, Nos. 396-397 and fig. 95.
[26] *ibid.*, rim patterns of type XIX, p. 67, figs. 29-43.
[27] Stillwell, R. (edit.): *Antioch on the Orontes*, Vol. III, Princeton, 1941: Waagé, F.O.: *Lamps*. pp. 60-62.
[28] Loeschke, S.: *Lampen aus Vindonissa*. Zürich, 1919. Pl. 23, No. 1078.
[29] Macalister, *op. cit.* (supra, n. 18), Pl. 77, Nos. 2, 3, 5, 16. Pl. 110, No. 2 and Pl. 112, No. 11, showing the lamp with fish-reliefs from the tomb of Stephanos Philochristos.
[30] Rostovtzeff, M.: *Dura-Europos and Its Art*. Oxford, 1938, p. 66 and p. 21, n. 10.
[31] Glueck, N.: *The Other Side of the Jordan*, New Haven, 1940, p. 193; also pp. 184-194. Fig. 116, Atargatis as fish-goddess and fig. 117, Atargatis as grain-goddess.
[32] Wright, G. E. & Filson, F.V. (edit.): *The Westminster Historical Atlas to the Bible*, London, 1945: Albright, W. F.: Introduction, p. 18.

Gezer and Tell en Nasbeh, where numbers of these polycandelon lamps have been excavated, are only 25 and 42 miles from Ascalon, respectively. The finding of lamp-moulds at Beit Nattif[33] (ca. 12 miles S. E. of Gezer) is evidence of the fact that lamps were made in the vicinity. Although only single-burner lamps were found there, together with the moulds, they show reliefs that bear witness to the fact that a fertility cult must have been adhered to either by the potters who made the lamps or by their patrons or by both. Waving wheat, ears of wheat, grapes and vines are repeatedly shown on the borders (supra, Beit Nattif, Pl.VII; 2). Amongst the other finds made there, the nude female figure seated in a niche (arch) with columns (Beit Nattif, Pl.VIII, 3) appears to be connected with a fertility cult, possibly a fertility goddess. Atargatis was a goddess of fertility and was worshipped both as 'grain goddess' and 'fish goddess' in the Nabataean temples of southern Trans-Jordan, at Khirbet Tannur, Kerak, Petra, etc. at one and the same time, i. e. about the first quarter of the 2nd century A.D.[34] A temple of Atargatis as the goddess of procreation and fertility was erected in Dura. (*Dura Europos,* p. 21, note 10). This was the period (2nd to 3rd century, Iliffe, el Bassa, supra) in which the polycandelon lamps were in vogue in Palestine. It may be permissible to assume that the fish on the polycandelon B is symbolic of Atargatis in her manifestation as the fish-goddess, in which form she was worshipped in nearby Ascalon and certainly in the surrounding country, as she was in places so far away.

The juxtaposition of the fish to the prominent ovals seems to express a symbolic relationship between them. If the fish are intended to represent Atargatis as the fish-goddess, it may well be that the concentric ovals (which bear a close resemblance to the lozenges of 'Die Raute'[35] and the

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[33] Beit Nattif is ancient Beth Leptepha. See Smith, G. A.: *Historical Atlas of the Holy Land.* London, 1936, Pl. 46-C 5. Baramki, D. C.: Two Roman Cisterns at Beit Nattif. *Quart. Dept. Antiq. Palest.*, 5, 1935, pp. 3-10, Pl. 12.

[34] Glueck, *op. cit.* (supra, n. 31).

[35] Doelger, F. J.: ΙΧΘΥΣ, Vol. I, 1910, fig. 74. Inman, *op. cit.* (supra, n. 16), p. 90, fig. 136. Waring, J. B.: *Ceramic Art in Remote Ages,* Vol. IV, Pl. 38, fig. 15. Text p. 77 shows double oval representing the Assyrian Venus, according to Lajard. Cf. also Moors: *Hindu Pantheon*

ovals of the Indian Yoni, i. e., the symbols of female fertility) represent her as the goddess of life. Atargatis, the Ishtar of Babylon, is the same Atargatis as the fish-goddess of Ascalon, the goddess of fertility and life, the procreative mother-goddess. This suggestion seems further strengthened by a comparison with the following polycandelon lamp C, Plate 23.

* * *

Lamp C: Plate 23.
L. 14.5 W. 9.5 H. 3.75 (cm).
Provenance and date as Lamp B (supra).
Light red clay, slightly incrusted on left side and on the bottom of the handle.

This lamp, like the preceding one, is intact—a rare condition where polycandelons are concerned. Usually the handle is missing or there is some other equally disappointing blemish.

A fish in low relief, with open mouth and eye to left, is on either side of the filling-hole, with head toward the nozzle and tail toward the handle. Directly in front of each fish-head is a figure in higher relief, consisting of two large concentric circles. The outer circle is formed by a ring of joined pellets while the inner circle consists of elongated pellets. A large central pellet is enclosed.

The top of the nozzle-half of the lamp is covered by seven parallel rows of herring-bone in relief, in a rippling design resembling waves of water. There are seven wickholes, all showing slight traces of smoke. An irregular and poorly formed flat band (loop) handle has been asymmetrically attached by hand after the lamp was removed from the mould.

The bottom of the lamp follows the shape of the top. There are three short parallel lines in low relief running from the nozzle-end towards the

for the yoni frequently quoted by Inman. Refer also to n. 19 *(supra)*. See further Inman, *op. cit.*, p. 80, fig. 119-120; p. 132, fig. 177 of the Appendix by J. Newton. Cf. also Lajard, A. H.: *Sur le culte de Venus* for concentric ovals and lozenges, Pl. 1, fig. 8 and Pl. 3, fig. 8.

Van Buren, E. D.: *Symbols of the Gods in Mesopotamian Art.* Roma, 1945, pp. 115-119, for the pointed oval' or 'rhomb' which has been variously explained as an eye, vulva, grain or corn, symbol of earth, lozenge, etc.

base. The raised base-ring is asymmetrical and has a circular groove. A poorly moulded central pellet is on the flat depressed center.

Although these two polycandelon-lamps have many points in common, there are some marked differences that should be noted. The workmanship of lamp C is greatly inferior to that of lamp B. The drawing of the fish on lamp C is conventional while that of lamp B shows a painstaking study of a definite fish. The two lamps may have been moulded in the same pottery bur they could not have been designed or executed by the same artist or potter. It would seem that lamp B had been the work of the master-potter himself while lamp C appears to be that of an apprentice in an attempt to follow in an artist's footsteps.

What has been said concerning the fish on lamp B, as far as symbolism is concerned, holds good for lamp C. The very prominent figures of the concentric circles are almost touched by the widely opened mouth of the fish. The mouth seems to be avidly approaching this object. (See detail, Pl. 23, B). Circles, single or concentric, with or without rays, have repeatedly been used as symbols to represent the sun amongst ancient peoples.[36] Atargatis was worshipped with her brother Adonis as one of the sky-gods (both children of the great Syrian god Hadad) at Dura.[37] As Dea Syria her cult spread widely and her worship became the religion of women not only of Syria but throughout the Roman Empire. As the 'Great Goddess' she was part of the solar henotheism, a counterpart of the Sol Invictus of Syria.[38] If, as is suggested, the fish on the present lamp C is symbolic of Atargatis in her manifestation as the fish-goddess, the relief of concentric circles with which she is here juxtaposed will represent the sun, the life-giving element, and her identity with it as the 'Supreme Goddess' of light and fertility.

* * *

[36] Goldsmith, E. E.: *Life Symbols*. 1928, p. 171. 'The hieroglyph of the sun-god Ra is a dot within a circle. It is still used as the astronomic sign of the sun. The circle symbolized the feminine principle in nature.'

[37] Rostovtzeff, *op. cit.* (supra, n. 30), p. 65.

[38] *ibid.*, pp. 67-68.

Lamp D: Plate 24, A. (Gift of Dr. H. G. Friedmann, New York).
L. 8 W. 6.5 H. 5 (cm).
Provenance unknown.
Dark brown clay with remains of worn red paint.
Date (of type) is 1st half of 4th century A.D.[39] *up to 8th century* A.D.[40]
Tip of the nozzle is missing. Rims of the longitudinal canal are chipped.

The lamp is pear-shaped. The large central filling-hole is surrounded by a concentric groove which broadens into a wide canal at the front. This canal extends to the wickhole at the nozzle-end. The bottom of the lamp has sloping sides which are continued into a circular base-ring. The base shows a depressed center with an eight-spoked figure in relief.

This lamp belongs to the type of Byzantine, Christian or early Arabic lamps which have recently been published in an attempt to establish a simple chronological order for this structural group.[41] These oval or pear-shaped lamps share the basic characteristics of lamp D but there are marked differences to be noted in the varying forms of relief on the slanting shoulders of the individual lamps. Sometimes these reliefs are purely decorative but often they bear Greek, less often, Arabic inscriptions. The Greek inscriptions are usually Christian with variations of the formula

ΦΩC $\overline{\text{XY}}$ ΦΕΝΙ ΠΑCΙΝ *(The light of Christ shines for all).*

In place of this inscription lamp D bears naturalistic reliefs of four fish, swimming one behind the other around the filling hole. This is unusual. Where animal reliefs appear on this type of oval lamp, the animals either confront each other[42] or the two sides mirror each other.

The presence of the four pellets on the longitudinal canal is conclusive evidence that the fish on this lamp are meant to be symbols of ΙΧΘΥΣ, pellets being one of the accepted figures of a discreet representation of the cross.[43]

* * *

[39] Iliffe, *op. cit.* (supra, n. 17) for early dating of type (4th century); Waagé, *op. cit.* (supra, n. 27), pp. 172-175, type 56; Meurdrac, M.: Une sépulture chrétienne à Sidon. *Berytus*, 4, 1937, pp. 130-143.
[40] For later dating of type see: Day, F.: Early Islamic and Christian Lamps. *Berytus*, 7, 1942, pp. 70-1. [41] *ibid.* [42] *ibid.*, p. XI-I. [43] Meurdrac, *op. cit.* (supra, n. 39), Pl. XIII, Fig. 3.

Lamp E: Plate 24, B.
L. 10. 2 W. 6 H. 3.5 (cm).
Provenance—Carthage.
Date—4th to 6th century A.D.[44]
Heavy red clay, slightly incrusted. Tip of the nozzle restored.

Lamp E is one of the well-known type of red terra-cotta lamps which were found in large numbers in the necropolis of Carthage.[45] (They form Type xxxi of the Corinth lamps).[44]

While conforming to the basic characteristics of the lamps of Corinth, Type xxxi, it differs from them and from most of the lamps from Carthage in that the discus bears only a rosette in relief instead of the more usual distinctly Christian motifs, or rarer Menorah[46] or Biblical scenes.[44]

Two well designed palm-branches with stems are on the rim. The distinguishing feature of this lamp, however, is the very small and rather unclear relief of a puffed-up fish, which lies in a cramped position, transversely across the near end of the shallow canal (or channel). It is unusual to find the fish on the canal or channel on this type of lamp. They are usually on the disk, lying longitudinally.[47] The palm-branch on this lamp has symbolic significance. It is an accepted Christian symbol. (cf. Delattre, supra, n.16, [pp. 12-13], the Palm and Horse Lamp). It is designedly used here where the simple herring-bone might have been more in keeping with the coarse and somewhat crude workmanship of the lamp itself. The palm-branches combined with the fish leave no doubt as to the Christian significance of this lamp.

[44] Broneer, *op. cit.* (supra, n. 13), pp. 118-119, Pls. 21-22.
[45] Delattre, *op. cit.* (supra. n. 16), pp. 38-39: Le chandelier mosaïque. Cf. also Broneer, *op. cit.*, p. 121, n. 3.
[46] Delattre, *op. cit.*
[47] Doelger, F. J.: ΙΧΘΥΣ, Vol. IV, Pl. 152—No. 10. (But see Pl. 82, No. 10 for a fish lying transversely on the *discus*.)

SUMMARY

THE fish has been used symbolically by many ancient peoples and religions. There are many examples of the use of the fish as a symbol on early and late Pagan lamps as well as on Christian lamps.

Not every fish on a lamp of the early centuries of the Christian era before and after Constantine can be accepted as a symbol of ΙΧΘΥΣ. Only when the fish on a lamp is accompanied by other emblems of a cult or a faith can we be certain that symbolism is indicated. In addition to fish other animals, as well as, flowers, trees, water, fire, etc. have aroused the admiration and stimulated the imagination of primitive peoples (as well as of their descendants) and induced them to portray the things of nature with which they were most familiar in the attempt to satisfy the primitive urge for imitation as well as for decoration.

Amongst the five examples of fish-lamps presented, it is suggested that the zoomorphic lamp in the form of a fish is considered to be simply an imitative effort on the part of a lamp-maker (potter)—an observer of nature—to make an object of beauty for a useful purpose.

It is suggested that the two polycandelon-lamps and their reliefs are connected with the worship of Atargatis. The association of the fish with the prominent concentric figures on each (which are taken to represent the sun [on lamp C] and the female procreative element [on lamp B]) form the basis for this suggestion. Atargatis, the fish-goddess, was also a solar goddess, and a goddess of fertility. The relief are all symbols of a fertility cult.

Lamps D and E are considered to be definitely Christian. The fish can be here accepted as the symbol of Christ, of ΙΧΘΥΣ, as it is represented with another undisputed emblem of the Christians, i.e., the cross on lamp D and the palm-branch on lamp E.

Acknowledgements: I am greatly indebted to Professors L. A. Mayer, E. L. Sukenik and A. Reifenberg of the Hebrew University of Jerusalem, and to Miss Theresa Goell, American Excavations of the Princeton School of Graduate Studies at Tarsus, who have read the manuscript and made several corrections. The lamps were photographed by Dr. Edith Porada, New York City, who has also materially added to the source material by her helpful references to comparable reliefs on cylinder seals.

The Rock-carved Façades of the Jerusalem Necropolis*

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It is a common feature of many tombs and sepulchral monuments of the ancient world that they are shaped in imitation of buildings. This feature can be traced from the Chalcolithic Age[1] down to the various mausolea of the classical and later periods. In underground rock-cut tombs, the desire to maintain this tradition led to a special treatment of the exterior, and architectural forms were sculptured on the vertical plane of the façade, giving it the appearance of a building, or of an essential part of one. Such adorned façades are widespread in the rocky regions of the Eastern Mediterranean countries, and especially in Asia Minor and at Petra.

In this wide geographical area, the Jewish necropolis of Jerusalem, dating approximately to the last two centuries of the Second Temple, is of particular interest. The style of its architecture is of Graeco-Roman origin, as far as architectural elements and various decorative devices are concerned, but the treatment of the details and the conception of their composition show many features which are peculiar to this necropolis. They exemplify the essentials of the Jewish sepulchral art which developed at that time.

Within the narrow limits of this paper an attempt will be made to classify the different types of façades according to the disposition of their main architectural features, and to show the development from the plain front with its unadorned entrance to the highly decorated façades with

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* Paper read at the World Conference of Jewish Studies, Section of Palestinology, held at the Hebrew University of Jerusalem, July, 1947.

[1] For a house-shaped ossuary see Sukenik, *Journ. Palest. Orient. Soc.*, 17, 1937, No. 1, Frontispiece.

columned porch and moulded entablature, imitating structures of classical orders. It will be a typological survey and not a chronological one, as 'early' or 'late' in this class of architecture finds its expression not so much in the general lay-out of the façade, as in details of style and execution.[2] So, for instance, the style of decoration on a tympanum has more bearing on the dating of a tomb than the presence of the pediment itself. It is not the mere existence of the Doric frieze that is the decisive factor for its dating, but the shape and proportions of its details. The highly decorated façade may be contemporary with the plain front, the difference being merely a matter of means and taste. Large underground tombs have sometimes a very modest façade, whereas but a few burial-chambers may exist behind an elaborate front.

The three free-standing monuments in the Kedron Valley are not referred to in our survey, as their peculiar character requires special treatment.

For the façade of an underground rock tomb a perpendicular wall is essential; so if a natural cliff was available it was made use of. In most cases, however, a part of the slope of a hill had to be quarried away in order to create a perpendicular wall in the rock. The worker then cut a small opening in this wall through which he penetrated into the heart of the rock by excavating chamber after chamber.

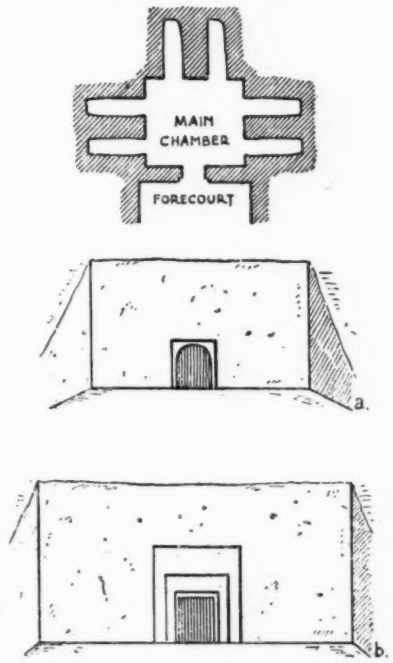
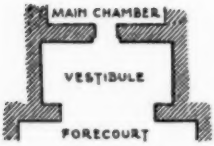


Fig. 1. Façades with a small entrance to burial chamber.

[2] This rule stands for the bulk of the tombs which constitute a more or less homogeneous group in classical or pseudo-classical style. It is not valid when discussing a façade of a basically different conception as for instance fig. 9.



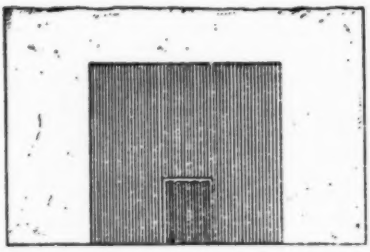


Fig. 2. Façade with wide entrance to vestibule.

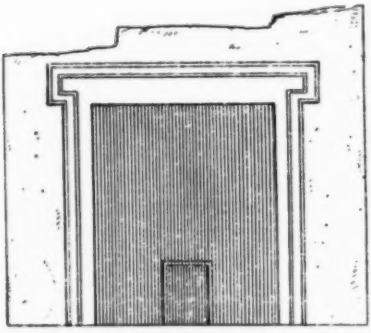


Fig. 3. As 2, with moulded jambs and lintel.

Such a plain wall of moderate dimensions, with a small opening at its centre, constitutes the modest façade of most of those tombs which are entered directly from an open forecourt with no vestibule in between (Fig. 1a). The square opening is often surrounded by stepped fillets, thus emphasizing the function of the entrance door and animating the monotony of the otherwise plain wall through effects of light and shade (Fig. 1b).[3] These recesses form the most simple architectural decoration on the tomb-façade.

When the plan of the tomb was altered by the addition of a vestibule before the tomb-chamber, (see plan in Fig. 2), the façade changed accordingly. The wide entrance of the vestibule, usually plain and undecorated, dominated the area of the façade, and beyond, in the background, the small opening leading to the tomb-chambers was visible (Fig. 2). It is these two façade-types which occur most frequently in the rock-cut tombs of Jerusalem.[4] In a few cases the wide doorway is surrounded by a moulded frame giving it the appearance of a gate (Fig. 3).[5]

The entrance-gate reaches its ornamental completeness by the addition of a superimposed pediment. It is a combination of two architectural

[3] Many tombs outside Jerusalem have their entrances set in an arched recess.
[4] Hence no reference is made to specific tombs.
[5] Cf. Dalman, G.: *Orte u. Wege Jesu*, 1924, fig. 47.

elements of different functions: the moulded frame typical of a doorway, and the pediment with its acroteria, originally the crowning member of the front of a building in the Greek style. This combination developed in the Hellenistic period and it found widespread application in the architectural ornamentation of the successive periods. The tympana of the pediments crowning the entrances of our façades are either plain, or they are decorated with floral motives in a style characteristic of Jewish decorative art. These ornamented pediments are peculiar to some distinguished tombs, such as the 'Tomb of the Judges' (which has such pediments above both the outer and inner entrances), the 'Tomb of Jehoshaphat', and the 'Grape

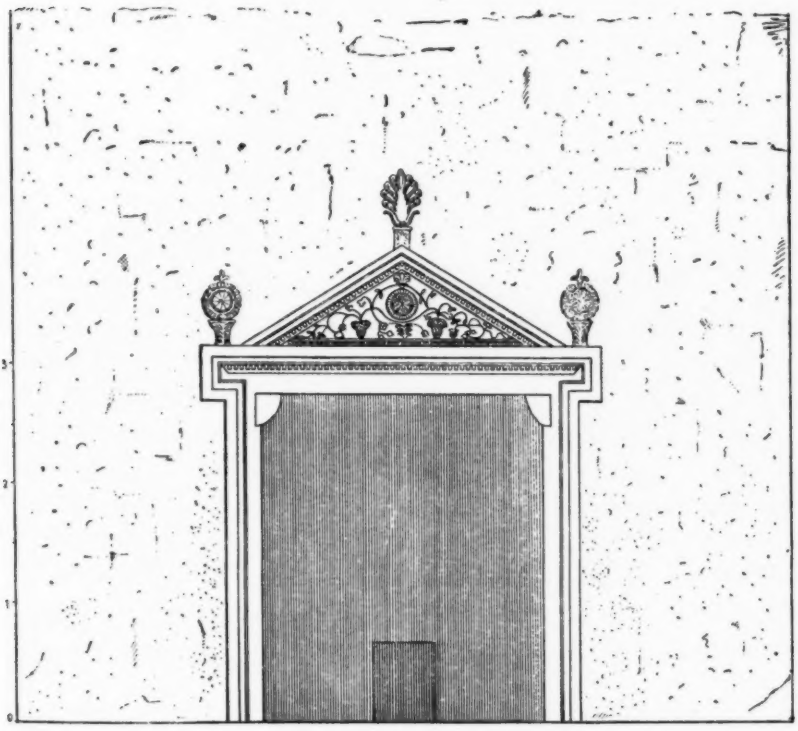


Fig. 4. Entrance with mouldings and pediment.

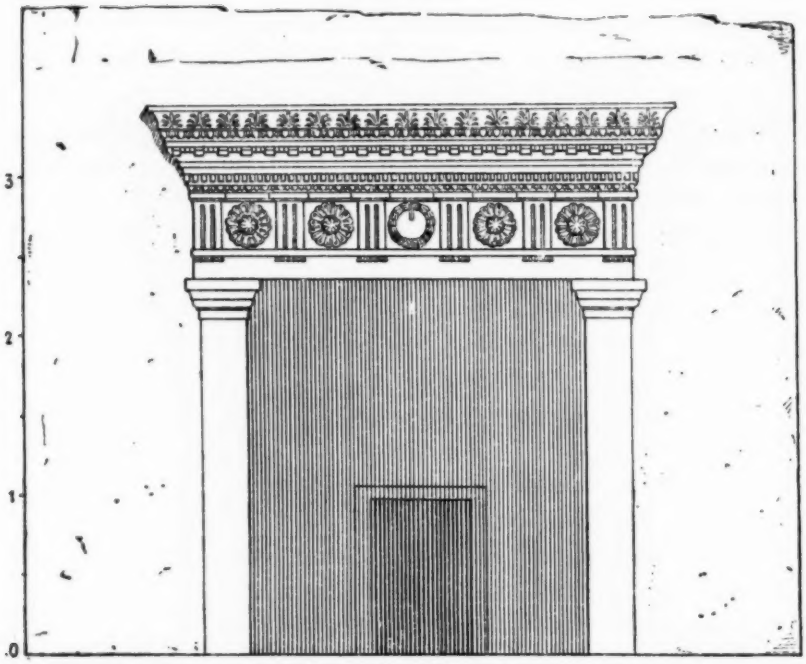


Fig. 5. Entrance with decorated entablature on *antae*, partly restored.

Tomb' which is illustrated in Fig. 4.[6] Some smaller entrances to burial-chambers of both the types mentioned above are surmounted by gables with plain tympana.[7]

An entirely different conception is met with at the entrance of a tomb in the 'Street of the Prophet Samuel'.[8] A lintel in the form of a decorated entablature consisting of an architrave, a Doric frieze and a cornice, is carried by two *antae* flanking the opening (Fig. 5). Here we have the essential structural elements of a building, obviously borrowed from the front of a small temple. Such representations, with the addition of a pediment, were generally applied as ornaments to entrances of classical and pseudo-

[6] Cf. Macalister, *Quart. Stat. Palest. Explor. Fund*, 1900, Pl. III, facing p. 59.
[7] Occurring particularly in the southern necropolis.
[8] Cf. Macalister, *Quart. Stat. Palest. Explor. Fund*, 1902, p. 119.

classical buildings. This type of façade is very rare in the necropolis of Jerusalem.[9]

With the appearance of columns in the wide opening of the porch, a new characteristic feature is added to the façade. It takes the shape of a Greek distyle *in antis* front, without its gable.[10] Fig. 6 represents the front of the tomb of Bnei-Ḥezir, with two columns between *antae* carrying a Doric entablature. It constitutes a vivid representation of a classical structure. These developed façades of the columned porch type seem to have attracted the well-to-do families, as a considerable number of them

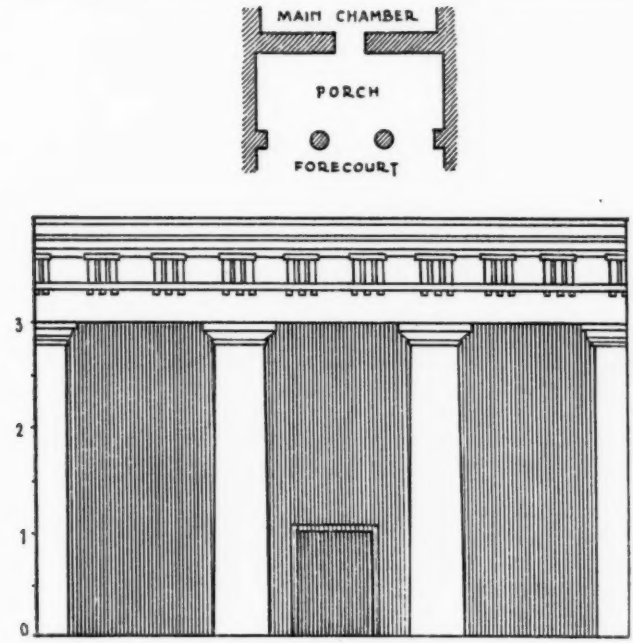


Fig. 6. Porch: distyle *in antis*.

[9] For a similar disposition on a rock-hewn façade in Asia Minor see J. Durm, *Die Baukunst der Griechen*, 1910, fig. 215.

[10] A feature common to all porches in the Jerusalem necropolis and elsewhere in Palestine. Watzinger attributes the omission of the gables to the flat form of the local roof (*Denkmäler Palästinas* II, 1935, p. 61).

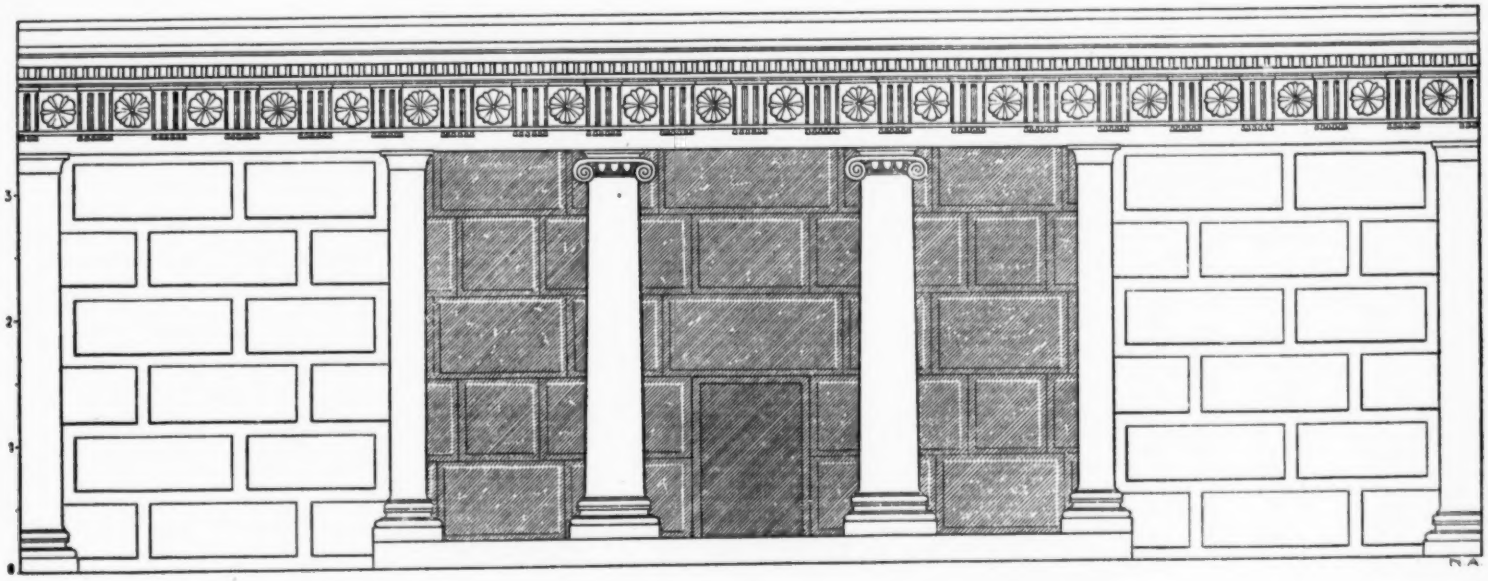


Fig. 7. As 6, with *antae*-walls and prolonged entablature, restored.
The Ionic capitals are conjectural.

have been found both at Jerusalem,[11] and also among the tombs in other districts of Palestine.[12]

As a further illustration another interesting example of this type may be mentioned, namely the tomb called Mugharet Umm el-'Amed[13] (Fig. 7) Here, the desire to imitate a building reaches its culmination by the imitation in the rock of drafted masonry. The entablature runs beyond the distyle *in antis* porch and rests at both ends on pilasters. The architect of the tomb had evidently in mind some existing public edifice, built in the Hellenistic style, which he tried to imitate. No exact identification of the prototype is possible, but looking for some parallels of conception and lay-out, one is reminded of the two-storied façade of the famous structure of the Tobiad family at 'Arak el-Emir in Transjordan, which is built of huge drafted masonry.[14] In the Jerusalem tomb too there may have been some kind of superstructure in masonry, an indication of which may be seen in the treatment of the upper rock surface of the tomb. The existence of two-storied façades among the tombs of Jerusalem is attested by a portion of a rock-hewn façade found in the northern necropolis: it shows a part of the lower storey and the lower portion of the storey above it. Fig. 8 shows a restoration of this façade as proposed by the excavator, with alternative flat or gabled roofing.[15] This façade forms an important link

[11] Two more façades of the distyled portico type with decorated entablatures are discussed in the course of this paper. The most elaborate porch of this kind belongs to the Tomb of Queen Helena. (For the latest study on this subject cf. M. Kon, *The Tombs of the Kings*, 1947, in Hebrew). A porch without a moulded entablature, the two columns *in antis* supporting only a plain architrave, has recently been published (cf. Avigad, *Palest. Explor. Quart.*, 1947, p. 120, fig. 5). Of two other distyled porticos no traces of the entablatures are left. The one belongs to the Tomb of Nicanor (*Quart. Stat. Palest. Explor. Fund*, 1903, p. 328), the other to a tomb now situated below the Aceldama Monastery in the Valley of Hinnom (cf. Macalister, *Quart. Stat. Palest. Explor. Fund*, 1901, p. 157).

[12] Deir ed-Derb: *Survey of Western Palestine, Mem.* II, 1882, p. 314; *Revue Biblique* 1910, p. 124, Pl. II. Khirbet Kurkush: *Survey of Western Palestine, Mem.* II, p. 337; *Revue Biblique*, 1910, p. 116, Pl. I. Mokata 'Abud: *Survey of Western Palestine, Mem.* II, p. 362. Tibneh: *ibid.* p. 375.

[13] Avigad, *Kedem* II, 1945, p. 79, fig. 4; *Palest. Explor. Quart.*, 1947, p. 116, fig. 2.

[14] Dated to the second cent. B.C. Cf. Butler, *Ancient Architecture in Syria*, Princeton Expedition II, A, 1907, Pl. I; W. F. Albright, *The Archaeology of Palestine*, 1949, fig. 49.

[15] Galling, *Zeitschr. Deutsch. Paläst. Ver.*, 1936, fig. 5, p. 118. The same outhor suggests the existence of an upper façade on the tomb illustrated in fig. 5.

between the Jewish sepulchral art and that of Petra, where two-storied façades are the rule, though executed on a much more imposing scale.

So far, we have noticed that the architecture of the rock-cut façades is of a distinctly homogeneous character composed of well known Greek patterns. An entirely different, and so far unique, conception is to be seen in the façade of a rock-cut tomb in the Valley of Hinnom.[16] Of the front, a few remnants only still exist, but its reconstruction as illustrated in Fig. 9

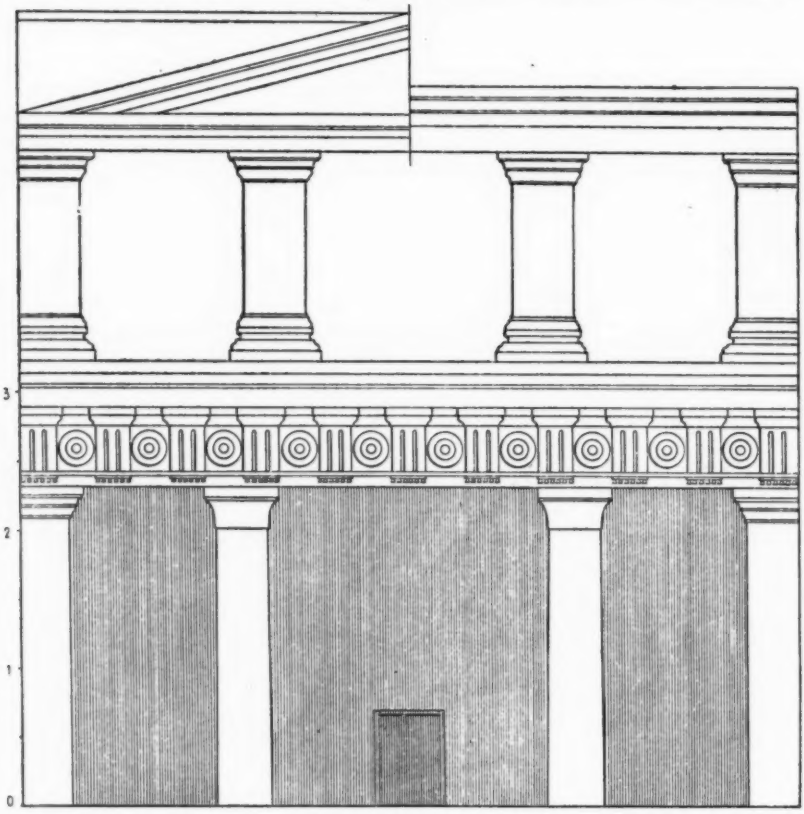


Fig. 8. Two-storied façade, restored. Capitals of upper pilasters & parts above are conjectural.

[16] Dalman, K.O.: *Zeitschr. Deutsch. Paläst. Ver.*, 1939, pp. 190-208, fig. 3.

seems to be well founded on its principal lines. The upper part is hypothetical, as no remains of it have survived. Here the difference of conception is striking. It is obvious that the architecture of this façade differs widely from that of the rest of the Jerusalem necropolis, and their contemporaneity has lately been disputed.[17] The three-door façade is typical of Syro-Roman architecture of the Imperial age and is a characteristic feature of the synagogues of the 3rd cent. A.D. However, as already pointed out,[18] the composition of these façades is ultimately derived from Greek tradition, and so our façade may have been influenced by earlier prototypes.

The conch above the middle door is another interesting feature. As a rule, the shells known in the Near East have their hinge at the bottom; this is also the case on conches of the ancient Synagogues. Conches with the lines radiating downwards, as they do in our case, are rare features in Palestine. They occur in Syria in the 2nd and 3rd cent. A.D., and one found in Jerusalem dates from the time of Hadrian.[19] In Italy, however, the conch with its hinge at the top occurs as early as the Augustan age.[20]

We may therefore conclude that the façade of the tomb in the Valley of Hinnom shows early Roman influence, and it may be assigned to a time before the destruction of the Second Temple, after which the execution of such a work on behalf of the Jews in Jerusalem is unconceivable.

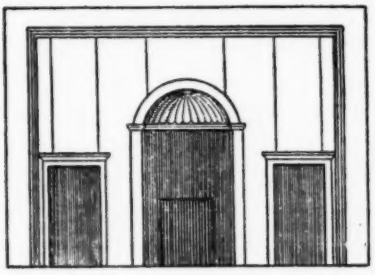


Fig. 9.
Three-door façade, restored.

Fig. 10.

[17] K.O. Dalman, in his valuable survey of the tomb, is convinced of its Jewish workmanship, but is inclined to date it after 70 A.D., mainly on account of the totally different character of its façade.

[18] Kohl-Watzinger, *Antike Synagogen in Galilaea*, 1916, p. 163.

[19] Watzinger, *Denkmäler Palästinas* II, fig. 7.

[20] Robertson, *A Handbook of Greek and Roman Architecture*, 1943, p. 230.

The plan of the tomb and its inner architecture (decorated domed ceilings, false gabled doors) point also to this date. Why the craftsman of this façade departed from the traditional conception of all other tomb-façades in Jerusalem, and how he was inspired by new ideas, we can hardly guess.

Another interesting example of similarity between rock-cut architecture and some architectural features of ancient synagogues, may be found in a tomb at Khirbet Kurkush in the Samaria district, SW of Nablus.[21] The door opening (Fig. 10) with its distinct π-shaped mouldings and the fluted frieze with a central emblem (?) above the lintel, crowned by a moulded cornice, bear a strong resemblance to some of the doors of earlier synagogues in Galilee,[22] e. g. the central doors of both synagogues of Kfar Bir'am,[23] and that at Meiron. Moreover, the architrave of the porch of this tomb is decorated by a central rosette flanked by two wreaths. Similar triple decorations are typical of lintels in ancient synagogues. Rosettes and wreaths occur, however, on ossuaries and on Doric friezes, and doorways of the above-mentioned type are to be found in Hellenistic buildings.[24]

In conclusion, we may say that the decorated façades are carved in imitation of architectural structures; structural elements being reduced to features of ornamental value. Some of the façades clearly show good Hellenistic tradition, while others are of debased style; but all of them drew from sources of classical forms. The sepulchral art of the rock-carved façades is not to be regarded as an independent and creative art, but merely as a secondary, imitative one. We may assume that some of the above mentioned façades are modelled in imitation of some structures which may be regarded as prototypes of certain architectural features, later adapted to ancient synagogues.

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[21] Cf. *Surv. West. Pal., Mem.* II, p. 337; Savignac, *Revue Biblique*, 1910, p. 116 ff. Pl. I, named Kh. el-Fakhakhir.

[22] This resemblance noticed by Conder in *Surv. West. Pal.* II is strengthend by his drawing showing a superimposed arched niche above the lintel. Savignac's photograph, however, shows that this niche is a later work, roughly executed, spoiling a part of the cornice above the entrance, and off the axis of the door. In our drawing, which is based on this photograph, the niche is therefore omitted.

[23] Cf. Kohl-Watzinger, *ibidem;* Sukenik, *Ancient Synagogues in Palestine and Greece*, 1934.

[24] Robertson, *op. cit.* (supra, n. 20), fig. 93.

Geomorphology of the Central Negev Highlands

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THE geographical division of Palestine into four major longitudinal belts has been generally accepted for a long time. These four regions are:— the Coastal Plain, the Western Highlands, the Jordan Rift Valley, and the upland-rim and plateaus of Trans-Jordan. But, at least within the area of the first two of these regions, a north-south division is not less prominent. The major morphological border in Palestine west of the Jordan-Valley, most of it in Israel today, runs between the Hills, (the southern part of Judea) in the north, and the Negev Highlands in the south, i.e. through the Beersheba Basin and the Dead Sea at the latitude of the Lisan Peninsula.

North and south of this dividing belt we find profound differences in most of the geomorphological features. These differences are the more accentuated as they affect the exact position of the main climatic boundary of the country—the border of aridity: this border divides areas receiving rainfall sufficient both in amount and reliability for normal agriculture from those which are deficient in amount and reliability of rainfall; here, therefore, permanent cultivation is possible only by applying various irrigation techniques. The border of aridity in turn divided throughout history the two major settlement areas of the country—the north with its permanently sedentary population, and the south with intermittent or non-or semi-sedentary settlement.

* The author's thanks are due to his friend N. E. Rosenan who 'discovered' the *Makhteshim* many years ago and patiently discussed the problems concerned; to Mr. S. Vitkin who drew the illustrations; and to the Director, Department of Surveys, for permission to publish the contour map of the *Small Makhtesh*.

Only north of the Beersheba Basin do we find the clear division into longitudinal belts as a result of a general meridional alignment of the major surface elements. In the south the major elements no longer run north and south but north-east to south-west: this change in direction is co-incident with not less profound changes in the prominent surface features and tectonic structures.

The prominent feature of the Judean Mountains is the broad flat-topped highland region, rather uniform in appearance. Its width varies between 20 and 25 km. with deep lateral dissection along both its western and its eastern borders. The altitude of its central parts is 700-800 m. with the highest points exceeding 1000 ms.[1] Tectonically it is a broad arch, in itself partly folded and undulated.[2] It maintains its uniform features and height to well south of Hebron. Twenty kilometers beyond Hebron, south of Eshtemo'a (Samu'), culminations still exceed 600 and 800 metres, and only from here southwards we find, within 10 kilometres, the descent to 300-350 metres altitude in the Beersheba Basin.

The Beersheba Basin extends as a kind of funnel from the coastal plain eastwards, narrowing towards Beersheba: beyond Beersheba it widens again rising gently towards the crest of the deep descent to the Dead Sea. Following the direction of the Beersheba Basin to the east, we arrive at the narrowest part of the Dead Sea, where the large Lisan Peninsula protrudes from the eastern shore, dividing the deep northern basin from the very shallow southern one. In sharp contrast to the Judean Mountains in the north and the Negev Highlands in the south the Beersheba Basin is an area of deposition and not of erosion. We therefore find here alluvial soils, including large areas of valuable loess, covering the underlying bedrock.

As stated above, the major topographical features south of Beersheba strike NE-SW. They are a number of ridges, parallel to one another, with highly asymmetric forms:—a long and gradually ascending NW slope, contrasting sharply with a short and steep descent to the south-east. This

[1] Tell 'Asur', NE of Ramallah, 1016m; Ramat al Khalil, N of Hebron, 1020 m.

[2] Picard, L.: *Structure and Evolution of Palestine*. Bull. Geol. Dept. Hebr. Univ. Jerusalem, IV, 2-4. 1943. Ref. p. 8.

asymmetric sculpture is the direct expression of a pronounced asymmetric tectonic structure. Geologists[3] have described these structures as highly asymmetric anticlines, the dip of the NW flank being 6-10°, that of the SE descent 30-45°. Within the Negev Highlands we have five such asymmetric ridges—from NW to SE:—(I) the Rekhme-ridge, (II) Kurnub-ridge, (III) Ma'ale 'Aqrabim-ridge, (IV) Ramon-ridge, and (V) 'Arif-ridge. In general, the anticlines become steeper the farther they are situated to the SE. Apart from the peculiar forms of the steep SE slopes of these asymmetric ridges, about which more will be said presently, their most prominent features are the large circular erosional openings known locally as *Makhteshîm* or *Mortars.*

These features of the Negev Highlands are no isolated occurrences. The structures producing them begin to the north of our area in the Judean Desert and find an even more pronounced expression to the west of the Negev Highlands, in the Egyptian part of the northern Sinai Peninsula. At the same time both these structures and features undergo a consecutive change of direction from NNE-SSW in the Judean Desert, to NE-SW in the Israel Negev, to ENE-WSW in the Egyptian Sinai.

In the Judean Desert on the E flank of the Western Highlands of Palestine we have a succession of east-facing escarpments, running oblique to the direction of the rift valley. The relative height of these escarpments varies between 130 and 300-400 metres. They are apparently associated with different structures, such as monoclinal folds, fault-lines, etc.[4]

North of the latitude of Beersheba these features are but of secondary importance, being prominent on the E flank of the highlands only, whilst

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[3] Blanckenhorn, M.: *Syrien, Arabien und Mesopotamien.* Handbuch d. regionalen Geologie, V, 4. 1915. id: Geologie Palästinas nach heutiger Auffassung. *Zeitschr. Deutsch. Paläst. Ver.*, 54, 1931. pp. 3-50. Blake, G. S.: *Geology and Water Resources of Palestine.* Jerusalem, 1928. Id: *The Stratigraphy of Palestine and its Building Stones.* Jerusalem, 1936. Wellings' Observations of Dead Sea Structure (With discussion by Bailey Willis). *Bull. Geol. Soc. Amer.*, 49, 1938, pp. 659-667. Picard (1943), *op. cit.* Shaw, S. H.: *Southern Palestine. Geological Map on a scale of 1/250,000 with Explanatory Notes.* Jerusalem, 1947, incorporating the reports of the geologists of Petroleum Development (Palestine), Limited.

[4] Kallner (Amiran), D. H.: Outlines of the Geomorphology of Judea. *Bull. Soc. R. Géogr. d'Égypte,* 21, 1943. pp. 35-49.

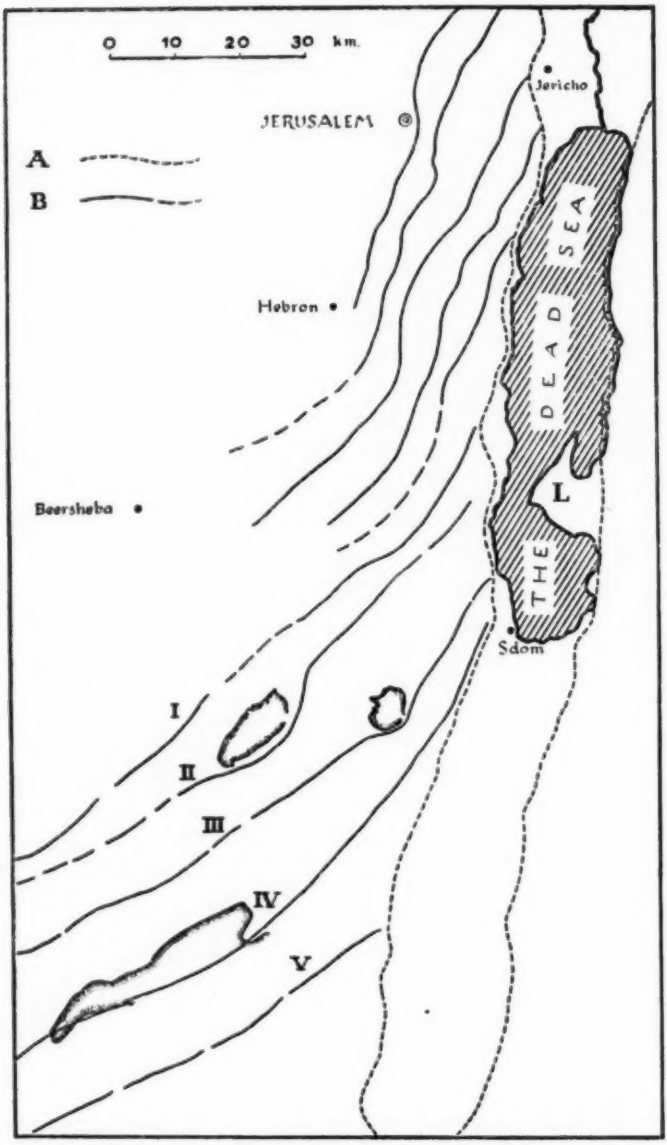

Fig. 1. Escarpment Lines of SE Judea and the Central Negev.
A: Border of the rift valley. B: Escarpment lines; broken lines used where escarpment is not continuous. L: Lisan peninsula.

the main features run in a meridional direction; but south of the Beersheba line the continuation of these structures becomes of overriding importance. This even expresses itself in a slight change of direction of the rift valley. Whilst the direction of the Jordan Valley and of the deep northern basin of the Dead Sea is N-S, that of the 'Arava—the part of the rift valley between the Dead Sea and the Gulf of Eilat—is approximately N 15° E, i.e. running at an angle of 13° to that of the northern part.[5] This general deviation of direction finds a parallel in the western mountain bloc, where the axis of the Judean Mountains south of Jerusalem runs 15-20° E as against the meridional direction to the north of it.

Whilst in the Judean Desert part of these features are normal escarpment-lines they become outstandingly asymmetric ridges in the High Negev. Taking the Kurnub-ridge (II) as an example, one gradually ascends from the 'Aro'er Valley at 540 m., to 560 m. at the foot of the NW flank of the ridge (distance 3 km.), and in another 3½ km. to the crest of the ridge at 650 m.; from here the sharp descent of 1½ km. leads down to the

Fig. 2. SE flank of Kurnub ridge (II) on outside of the *Large Makhtésh*. Sketched from photograph by S. Vitkin.

plain SE of the ridge at 360 m. These figures illustrate well the gradual sloping to the NW and the steep decline to the SE. The SE flank descends practically as an isoclinal slope to the SE with a dip of 30-55°, as the

[5] The bearing of the axis of the different sections of the Rift Valley in Palestine is as follows:-

Lake Tiberias to Dead Sea	2° E	Dead Sea, northern basin	5° E
Dead Sea as a whole	6° E	'Arava (Dead Sea to Gulf of Eilat)	15° E

Fig. 3. The *Small Makhtesh*. Contours at 25 m. vertical interval.
(By permission of the Director, Survey of Israel.)

crest of the ridge coincides with the crest of the anticline. This and the other isoclinal escarpments having a relative altitude of 300-600 ms. are the most outstanding landscape elements of the Higher Negev. The emergence of the sharply dipping strata at the top of this slope brings here about sharp 'hogback' crestlines.

It has been mentioned before that an outstanding feature of these ridges are large circular erosional openings: these are situated on the structural crestline of the ridges. Nothing indicates their existence whilst approaching them over the surrounding hills, and all of a sudden one stands on the top of a huge crater-like hollow surrounded by sheer, inward-facing, cliffs, 300-500 ms. high. (Plates 20 B, 21 A.) These *Makhteshim* are distinct from normal eroded domes in that the bent-up angle of the strata surrounds a dome with an elevated rim, whilst no elevated rim encloses a *Makhtesh*. The cliffs enclosing the *Makhteshim* clearly expose the gentle dip of the strata along the NW side and its gradual increase to the sharply dipping SE side. It is obvious that there is a genetic connection between these erosional features and the anticlinal structures.

Originally the series of cretaceous limestones forming the upper part of the *Makhteshim* had of course a normal stratification. (Fig. 4-I). When this stratification was gradually bent into an anticline (II), the outer part of the series of strata involved had to stretch over an area much larger than that of the inner part and much larger than that of the original area covered by it. As the bend increased to its actual angle of 45-55° (10° to the NW, 35-45° to the SE) this stretching of the outer strata became even more pronounced (III) bringing about both a thinning of the strata and the development of strong mechanical stresses normal to them. These tension effects have produced a certain amount of fracturing and jointing and thereby a considerable weakening of the structures.[6] Erosion would find a zone of minor resistance here. This together with the high local increase of erosional energy at the steep outer slope of the anticlinal ridge — having

[6] A geometric approximation shows that in a series of strata 800 ms. thick, bent at the angle occuring in the Ma'ale 'Aqrabim ridge, the length of the top layer will exeeed that of the bottom layer by about 13%.

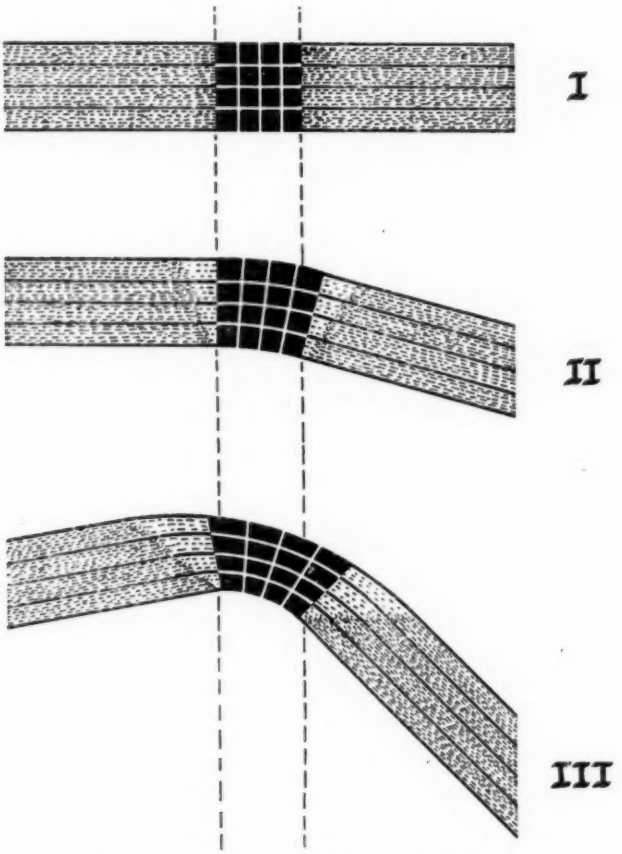

Fig. 4. Three successive stages in the bending of the anticlines. Stage III corresponds to the degree of bending actually observed. (Drawn by S. Vitkin)

a gradient of as much as e.g. 430 m. in 1½ km. (or 29%) at Ma'ale 'Aqrabim — provided headward erosion with the power necessary to open the crest of the anticline. The high amount of erosion active on the steep SE facing slopes is shown by the fact that the adjoining level area at their foot consists for nearly half a kilometre of steeply dipping cretaceous strata — the eroded outer part of the anticline.

This seems to be the general mechanism which brought about the development of the *Makhteshim.* Apart from some rudimentary developments we find three such *Makhteshim* in the High Negev. Beginning from the NW we find in the Kurnub-ridge (II) the *Large Makhtesh,* in the Ma'ale 'Aqrabim-ridge (III) the *Small Makhtesh,* and in the Ramon-ridge the largest of the *Makhteshim* in the Israel Negev.

If the strong vertical bend of the anticlines is the main reason for the erosional opening of the *Makhteshim,* it should be expected that these may form wherever the anticlines develop the necessary angle of fold: as a matter of fact, however, we find in each of the major anticlinal ridges *one* such *Makhtesh* only. This proves without doubt that an additional factor must be involved.

It appears that this additional factor is provided by the change in direction of the structure-lines from NNE-SSW in the Judean Desert to NE-SW in the High Negev as referred to above. This change in direction produces horizontal stresses similar to the vertical ones of the anticlines just discussed. Only by the combination of the vertical tension in the anticline with the horizontal one of the changing direction of the structure-lines, do the strata undergo the weakening necessary to produce these peculiar erosional hollows. These then are situated in the area where the structure-lines undergo their sharpest, and double, change of direction. That they indeed occupy a kind of hinge-position in the anticlinal ridges[7] can be seen very clearly in the cases of the Kurnub (II) and Ma'ale 'Aqrabim (III) ridges. In the Kurnub ridge the area of the *Makhtesh* forms a veritable bulge clearly protruding from the general alignment of the ridge for the observer coming from the NE. This bulge seems to be the first indication of dome structures in these anticlinal lines. That this interpretation of the origin of the *Makhteshim* as situated on the horizontal hinge of the ridges is correct seems to be corroborated by their drainage pattern.

[7] The question of the reason for the change in direction of the anticlinal ridges is not discussed here, being in the competence of tectonic geologists: generally speaking it seems connected with forces of folding coming from NW being opposed by the huge crystalline bloc of the Sinai granite in the southern part of the Sinai-Peninsula, protruding northwards as far as the latitude of *Makhtesh Ramon* on the eastern side of the Rift Valley.

To excavate these huge hollows erosion had to remove a vast amount of material. This required the opening of an erosive channel through the surrounding cliffs. As the Dead Sea is the deeper basis of erosion, and as locally the strongest erosive impulses are connected with the steep and high SE-facing slopes of the anticlines, all three *Makhteshim* are drained by wadis (i. e. rivers of episodic flow) running towards the Dead Sea.[8] These erosive outlets effect the *only* breach in the walls of the *Makhteshim*, in every case in the part facing SE.[9] They are narrow V-shaped outlet-valleys. The removal of the weathered and eroded material is facilitated by the episodic régime of erosion prevailing here. Although streams flow on a small number of days in winter only—the actual number may vary between 5 and 20 days per year—the amount of water flowing in the wadis on these rare occasions is sometimes tremendous.[10] The high admixture of gravel and other suspended material in these torrential floods gives them a very high mechanical efficiency. These very heavy floods move remarkable amounts of gravel of all sizes as can be seen in any wadi-bed. It is these gravel-floods which are the major erosive agent.

The *Small Makhtesh* is by far the smallest of the three as its name indicates *(cf. Table)*, and is therefore the most nearly circular one. It seems obvious, therefore, that this is the youngest of the *Makhteshim*. In sequence

[8] The *Makhtesh* of Kurnub is drained by the Yorqe'am Valley, that of Ma'ale 'Aqrabim by the Hatzera Valley, both tributaries of the Zin Valley. *Makhtesh Ramon* drains through Niqra Valley into Marzeva Valley and the 'Arava Valley. This and Zin Valley fall into the south end of the Dead Sea.

[9] The name *Makhtesh* (meaning *Mortar*) is, therefore, not quite appropriate, as the interior of a mortar is enclosed by unbroken walls whilst these features have all one breach each in their wall. Shaw[3] called them 'cirques' and this term was adopted on his advice in the 'Palestine, Index Gazetteer' published by Survey Directorate, GHQ, ME, Cairo, 1945, cf. p. 49, 199. But as cirque as a geomorphological term is reserved for nivation-cirques, its adaption for a totally different feature does not seem desirable. Picard[2] somewhat evades this difficulty by speaking of 'erosion-cirques'. *Makhtésh*, מכתש, is the singular form, the plural being *Makhteshim*.

[10] The following figures may give an idea of the amount of water involved in such peak-floods. The discharge of the Beersheba Valley at Beersheba was 778 m^3/sec on 11.11.1944, and for the total flood-period 11.-16.11.1944 7,127,000 m^3. The discharge of Zin Valley at Dead Sea South on 13.5.1945 exceeded 600 m^3/sec. (Cf. Govt. of Palestine, Irrigation Service: *Water Measurements 1944-1945*. Jerusalem, 1947. Ref. pp. 45, 90, 64.)

of time the establishment of the outlet gorge preceded the excavation of the *Makhtesh*. As we assumed that the *Makhteshim* developed at those points of the asymmetric bends of the anticlines where the tension effects are increased to a maximum at the horizontal hinges caused by the change in direction of the anticlinal ridges, it is obvious that the development of every *Makhtesh*—and together with it the siting of the outlet gorge—should have started at this horizontal hinge or very near to it. If this assumption is correct, its reverse should be correct as well. It may, then,

MEASUREMENTS OF MAKHTESHIM

Makhtesh	Long Axis (km)	Short Axis (km)	Average Depth (m)	Max. Depth (m)	Highest Point on NE Rim (m)	Deepest Point (m)	Height of Bottom at SW End (m)	Highest Point on SE Rim (m)	Bottom at foot of SE Slope (m)
II *Large Makhtesh*	14	5	250	410	690-710	300	500	610-704	320-360
III *Small Makhtesh*	7½	4	450	520	540	20	140	330-410	-20
IV *Makhtesh Ramon*	37	5-7	250-350	590	890-1006	420	665	900-980	470-600
V *Makhtesh 'Arif*					957	710	770	880	610

be stated that the position of the outlet gorge indicates both the oldest part of the *Makhtesh* and the region of the horizontal hinge of the anticlinal ridges. Once one drainage channel broke through the outer wall, it easily maintained erosive superiority and remained the only channel of the whole *Makhtesh*, gradually developing and increasing in size.

As the basic condition for the development of these erosive *Makhteshim* is the strongly asymmetric fold of the anticlines, it is obvious that their main axis of growth must be in the direction of strike of these anticlinal ridges. It is therefore only natural that they assume an elongated form, the more so as they grow in size. Whereas during the initial stages erosive excavation proceeded more or less equally on both sides of the outlet,

further development was directed particularly towards SW. This is clearly corroborated by the relative position of the outlet gorge, as shown by a comparison of the proportions of the long axes, NE and SW of the drainage outlet respectively:—

Large Makhtesh	II	1:7
Small Makhtesh	III	1:1.2
Makhtesh Ramon	IV	1:4

These proportions thus show that in the *Small Makhtesh* of the Ma'ale 'Aqrabim ridge (III), the youngest of the *Makhteshim,* the erosive outlet is situated nearly in the middle of the long axis, whilst the two older *Makhteshim* show a pronounced unequal development NE and SW of the outlet channel.

The results of geological investigations that are now being carried out should shed light on the reason for the major development towards the SW as against the negligible extension to the NE. This may be related to the fact that towards NE the anticlines are compressed into a narrower space whilst the distances between them open out somewhat towards SW.

But that the assumption of unequal development, not only in space but in time as well, is basically correct is proved by comparing the youngest *Makhtesh* (the *Small Makhtesh* of Ma'ale 'Aqrabim-ridge III) with the oldest one *(Makhtesh Ramon* IV). The *Small Makhtesh* shows all the fresh forms of youth with consecutive, unbroken, vertical, inward-facing cliffs surrounding it, broken at one place only—the outlet gorge. *Makhtesh Ramon*, on the other hand, is the most weathered one and most of its SE side is in process of being broken up into disconnected ridges: these will eventually disappear, and thus enlarge the gap of the main outlet channel, which is already as much as 8 kms. wide.

Both the *Ramon* and the younger *Large Makhtesh* of the Kurnub ridge show a decided rise of bottom, or shallowing, towards the SW end (cf. Table). The same development is indicated in the youngest *(Small) Makhtesh* (III). Its SW wall is not quite homogenous—not a single cliff from rim to bottom: it rises with a step bearing a kind of natural shelf

100-150 m. below the rim of the wall. This lack of homogeneity in the otherwise homogenous wall of the *Makhtesh,* lowering precisely the SW wall of it, seems to prove that here too erosion is progressing preeminently SW-wards.

* * *

We have so far dealt with the *Makhteshim* of ridges II (Kurnub), III (Ma'ale 'Aqrabim), and IV (Ramon), as these are the largest *Makteshim* of the Israel Negev. Other ridges have *Makhteshim* as well, but these show different types of development. The 'Arif-ridge (V) shows at Mount 'Arif (937m.) a very small *Makhtesh.* Its long axis is about 1 km., its short axis 400 m., and the depth exceeds 200 m. The geological map (Shaw[8] and p.34) shows here small outcrops of igneous rock. These occur, but to a much larger extent, in *Makhtesh Ramon* as well.

As mentioned above the anticlinal ridges and the *Makhteshim* of the High Negev of Israel are intermediate features not only in their direction of strike but in their tectonic and geomorphologic intensity as well: whereas in the Judean Desert we have relatively simple escarpment lines forming the eastern flank of an anticlinorial arch, accentuated in the High Negev to highly asymmetric anticlinal ridges with the *Makhteshim* discussed above, their continuation westwards in the Egyptian Sinai shows genuine dome-structures dipping outwards in all directions. These dome-structures are still highly asymmetric. Sadek[11] states the dip of the N flank to be up to 20^0; whilst the S flank dips with $45\text{-}90^0$, sometimes associated with fault-lines.

In the continuation of the Rekhme-ridge (I) we find 35 km. W of the Israel-Egyptian border the first of these domes—Jebel Helal—which still resembles fairly closely the Israel *Makhteshim.* Its highest point is 915 m., the lower part of the bottom 290 m., its depth therefore 625 m. It has one outlet to the south-east only, situated about symmetrical to the long axis. This outlet is called Wadi el Hadhira, the Arabic name applied to the *Makhteshim* of the Kurnub and Ma'ale 'Aqrabim ridges as well.

[11] Sadek, H.: The principal structural features of the Peninsula of Sinai. *C.R. XIV Congr. Géol. Int.* Madrid, 1926. 3. fasc. pp. 895-900.

50 km. further west we find the domes of Jebel el Maghara in the north, and Jebel Yelleg in the south. These are already proper domes, apparently in a more advanced state of dissection with very sharp surface forms, and have no longer one uniform drainage system. In the eastern part of Jebel el Maghara a deep inner erosive hollow has developed, but this has been too much destroyed to preserve the character of a proper *Makhtesh.*

SUMMARY

THE E-facing escarpment-lines of the Judean Desert are continued in the High Negev in strongly asymmetric anticlinal ridges. Their direction changes to NE-SW as against NNE-SSW in the Judean Desert. In the area of the change of direction where both the vertical fold of the anticlines and the horizontal bend of the structure-lines combine to bring about strong tension effects erosion has opened huge hollows, somewhat resembling elongated meteorite craters, known locally as *Makhteshím.* They develop from their original position at the bend of the ridges mainly in a SW direction bringing about an unequal development of the *Makhtésh* to the NE and SW of the outlet-gorge respectively. Different stages of development can be observed.

To the SE the anticlinal ridges descend with steep isoclinal slopes. The isoclinal character of these slopes as well as of those on the W flank of the Judean Mountains in the Hebron area[12] is proof of the general youthfulness of the relief.

The change of morphological pattern, from the Judean Desert with its east-facing escarpment-lines to the Negev Highlands with their anticlinal ridges and *Makhteshím,* is clearly marked by the Beersheba Basin. This change, however, is not confined to the West-Jordan Uplands but equally affects the Jordan Valley. Here it brings about a slight change of direction of the rift valley: it furthermore forms the southern border of its deepest trough, dividing the shallow south basin[13] of the Dead Sea from the major northern one,[14] and is further accentuated by the Lisan-Peninsula.

[12] Cf Kallner (Amiran)[4] pp. 37-8. For a more detailed analysis and illustrations compare Amiran, D.H.K.: The Western Border of the Hebron Mountains. *Bull. Jew. Palest. Expl. Soc.*, 14, 1949, pp. 112-118 *(Hebrew).*

[13] Maximum depth 12 m.

[14] Greatest known depth 399 m. (218 fathoms). Average depth exceeds 200 m.

NOTES AND NEWS

ONE of the aims of the ISRAEL EXPLORATION JOURNAL being 'to communicate to scholars abroad the results of scientific investigations of the Near East as carried out in Israel', it is proposed to publish in alternate numbers (1) a summary of notes and news on such scientific activities and (2) notices of important books and papers published in Hebrew, with a summary of their contents.

Since this is the first of the *Notes and News* it seems opportune to give a summary of the relevant events since the establishment of the State of Israel on 15 May, 1948.

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AFTER the dissolution of the Department of Antiquities of the Government of Palestine, and the demise of its publication, the *Quarterly of the Department of Antiquities* (last volume No. XIV), the Palestine Archaeological Museum with its collections, library and records, as well as most of the other scientific libraries in Jerusalem, became inaccessible to Jewish scholars.

In order to discharge the functions of the mandatory Department of Antiquities the ISRAEL DEPARTMENT OF ANTIQUITIES was established in July, 1948, with Mr. S. Yeivin as Director and Dr. I. Ben-Dor as Deputy-Director. The Department was at first attached to the Ministry of Labour and Construction, but was transferred to the Ministry of Education and Culture as soon as this was set up in July 1949. The Department is organised in six sections: Inspectorate, Survey and Excavations, Museum, Library and Archives, Conservation, Research. Since its establishment it has undertaken a series of excavations and conservation works; amongst its more important undertakings may be listed the excavation of a Middle Bronze Age tomb at Ma'ale ha-Hamisha near Jerusalem, of Chalcolithic remains at Affula, of a Herodian necropolis at Nathania, Israelite tombs near Hedera, Roman and Byzantine industrial installations in various parts of the country; it has continued the excavations at Beth Yerah (Khirbet Kerak) begun in 1944-46 and has undertaken exploratory work at Hippos (Susitha, Qal'at el Husn) and various other sites. The Department organised a provisional exhibition of its finds in July 1949; it has so far published two numbers of a Bulletin (*'Allon*) in Hebrew.

IN December, 1949, Dr. M. Stekelis on behalf of the Department excavated a prehistoric site near 'Evron in the coastal plain, 7 km. NNE of Acre: the finds included flints of the Lower Palaeolithic (Acheulean) and fragmentary remains of Elephas sp. In March to May, 1950, he continued the clear-

ance of the Neolithic (Yarmukian) site at Sha'ar ha-Golan. His report on the finds previously made on this site appeared in the first number of this *Journal.*

* * *

THE Palestine Meteorological Service, part of the Department of Civil Aviation of the Government of Palestine, was transferred nearly intact to the ISRAEL METEOROLOGICAL SERVICE which is affiliated to the Ministry of Transport and Communications. Mr. R. Feige, the founder of the Service and its Director since its establishment in 1937, was killed during the fighting in Jerusalem in May, 1949: he was succeeded by Mr. H. M. Gil'ad (Guttfeld), the former Deputy Director. The service is organised in four main divisions: Forecasting, based mainly on Lydda Airport, Climate (including the network of meteorological stations and a new section on agricultural meteorology), Research and Instruction, Administration and Services. The Service at present maintains, in addition to the main station at Lydda Airport, which makes half-hourly observations throughout the day, 52 full meteorological stations at which at least three observations per day are made, and about 350 rainfall stations in all parts of the country. The dew-observations according to the method of S. Duvdevani, which were introduced in 1943, are being continued at about 40 stations at present. In order to obtain factual information about the rainfall in the uninhabited areas of the Central and Southern Negev 20 totalisators have been erected since the autumn of 1949 and are being inspected every 2-3 months.

Meteorological data are being published in the following serial publications:- *Monthly* and *Annual Weather Reports, Annual Rainfall Summary* (containing an Annual Rainfall Map), *Annual Dew Summary.* In addition, a nonperiodical series called *Meteorological Notes* is being published containing studies in theoretical and applied meteorology and climatology.

THE winter of 1949-1950 was extraordinary for its low temperatures and snowfall and was the worst so far in a series of winters with snow beginning with 1941-42. During the night 26-27 January 1950, snow fell in all parts of the country and the cold increased during the early days of February reaching extreme conditions between the 5th and the 8th. By 6 February most of the country was snow-covered to a depth of 50 cm. and more. Snow covered not only all of the hill region but the Coastal Plain right to the shore, the Jordan Valley and parts of the Negev. Tel Aviv had its first daylong snow cover since its foundation. Snow covered the shore of the sea of Galilee 210 m. below sea level, and even at the Dead Sea, 390 m. below sea level, snowfall was recorded. In the mountainous part of the arid

Negev snow reached locally 70 cm. and paralysed motor-traffic there as elsewhere. Even at Eilat at the head of the Red Sea, at 29°33′ N latitude, snow was observed falling, although it melted on reaching the ground.

Most meteorological stations observed their lowest minimum temperatures on record on 6 or 7 February, reaching extremes of -8.1°C (17.42°F) at Mount Kana'an (Safad), -10.0°C (14° F) at Ramat David in the Emek and -13.1°C (8.4°F) at Tel ha-Tannim in the Beit Nattofa Basin (Sahl el Battauf), the absolute minimum temperature for Israel so far. Even at Eilat a minimum temperature of +2.5°C (36.5°F) was recorded.

The rainfall of the season was nearly normal in most areas. To early December amounts were rather low, but December brought excessively heavy amounts exceeding the average up to 300% in certain parts of the Coastal Plain. The seasonal total was 773 mm. (Average 739 mm.) at Haifa (Mount Carmel), 737 mm. (740) at Safad (Mount Kana'an), 634 mm. (505) at Lydda Airport, 552 mm. (622) at Jerusalem, and 478 mm. (373) at Degania in the Jordan Valley south of the Sea of Galilee. The greatest rainfall amount of the season was recorded at Ramat ha-Sharon, north of Tel-Aviv, viz. 970 mm. (473).

* * *

THE HEBREW UNIVERSITY of Jerusalem celebrated its 25th anniversary from 4 to 11 May, 1950. The celebrations culminated in an academic ceremony held on 5 May. At the time of its semi-Jubilee the University had 1550 students, an academic staff of 250 and five faculties—Humanities, Science, Law, Medicine and Agriculture.

THE Archaeological Department of the University has been pursuing its activities. Prof. E. L. Sukenik, assisted by N. Avigad, excavated the Samaritan synagogue at She'albim (Salbit) and the synagogue at Yafi'a near Nazareth, and the first number of the *Bulletin of the Louis M. Rabinowitz Fund for the Exploration of Ancient Synagogues* has been published. The main activities of the department, however, have centred round the Dead Sea scrolls, several of which had been acquired by the University in the troubled days of 1947: so far two provisional reports (*Megilloth Genuzoth* I and II) have been published by the Bialik Institute from the pen of Prof. Sukenik.

* * *

THE ISRAEL EXPLORATION SOCIETY (formerly the Jewish Palestine Exploration Society) has carried on its activities under the direction of Dr. B. Maisler almost without interruption. Dr. Maisler began the excavations at Tell Qasîle near Tel Aviv in the autumn of 1948, and has so far conducted three campaigns on the site (the first instalment of a report on which is

published in this number). He has also explored the site of 'Engaddi on the Dead Sea.

M. Avi-Yonah directed a joint excavation of the ISRAEL EXPLORATION SOCIETY and the Department of Antiquities at Giv'eat Ram (Sheikh Bader), west of Jerusalem: a Jewish settlement of the 1st century A.D., covered by a legionary brick factory, was found here. A sixth century Byzantine monastery, dedicated to St. George, was also discovered at this site.

THE annual Archaeological Conferences of the Society were carried on without a break; after the Tiberias Conference in October, 1947, with its undertones of the approaching war, the Fifth conference was held in war-scarred Jerusalem in December, 1948; the Sixth conference at Acre and in Galilee (Oct. 1949) and the Seventh conference at Tel Aviv (Dec. 1950).

* * *

A NEW society, the ISRAEL ORIENTAL SOCIETY, was founded at Jerusalem in January 1949 with Prof. S. D. Goitein, as president. The Society, with branches in Tel Aviv and Haifa, is publishing a quarterly in Hebrew *Ha-Mizrah he-Hadash* (The New East) of which the first volume has already been issued.

* * *

Obituary: The editors of the Israel Exploration Journal regret to announce the untimely death of Mr. ZALMAN LIF (LIFSHITZ), former Chairman of the Jewish Palestine Exploration Society. Mr. LIF was a distinguished cartographer, who organised the Israel Photogrammetric Institute and acted for many years as adviser to the Jewish Agency and then to the Prime Minister's Office on Lands and Boundaries.- Mr. GEDALYAH ALLON, Lecturer in Talmudics and the History of the Period of the Second Temple at the Hebrew University, died suddenly in 1949 at the age of 48. Mr. ALLON was one of the most distinguished of the younger Talmudists and historians of Israel.

* * *

Personal News: Prof. M. SCHWABE has been elected Rector of the Hebrew University for 1950-52. Prof. A. REIFENBERG has been elected Dean of the Faculty of Science for the same period.

Dr. I. L. SEELIGMANN has been appointed Lecturer in Biblical Studies and Dr. A. SHALIT Lecturer in the History of the Jewish People (Period of the Second Temple).

Dr. B. MAISLER has been invited by the Government of the United States to lecture as exchange professor on Biblical History for one year at the Oriental Institute of the University of Chicago.

Tell Qasile (air photo)

A: General View of the Area of Excavations in the South of Tell Qasile
(Seen from north)

B

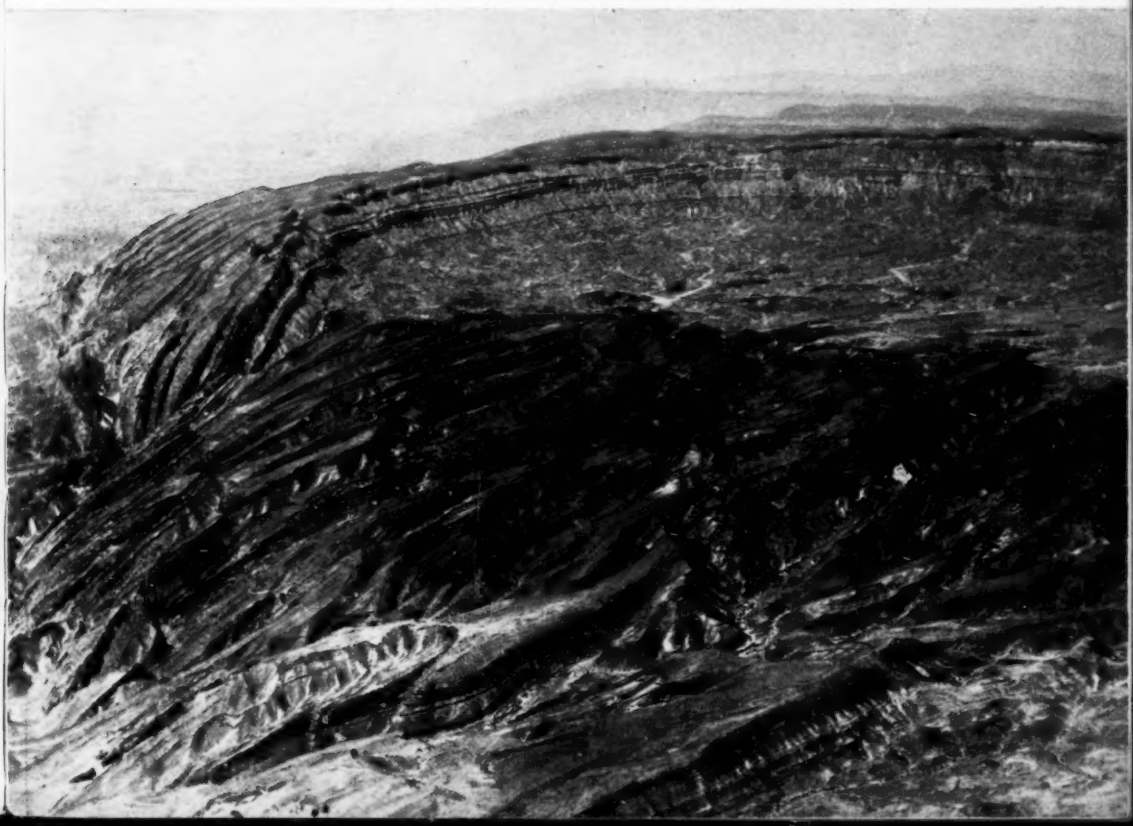
PLATE 20

GEOLOGY OF THE YARKON VALLEY

A: Coastal hills south of Tel-Aviv harbour. — Bed of Lower Hamra Sand (dark-coloured, with vertical cracks) containing Upper Palaeolithic flints between two Kurkar beds (Lower and Upper)

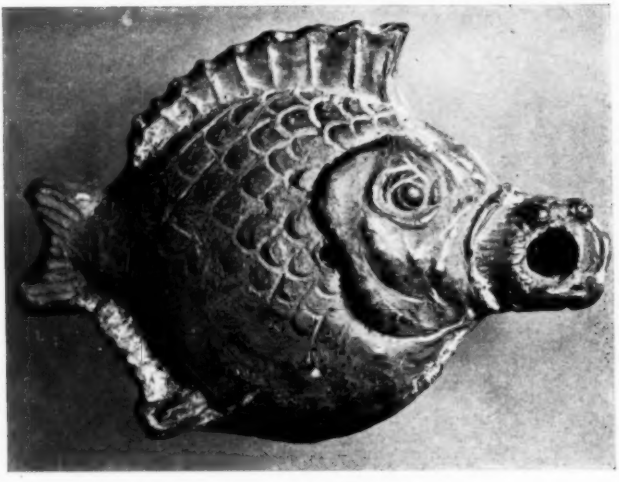
B: The *Small Makhtesh* from ESE; showing down-bend of strata, inward facing cliffs and outlet gorge. (Courtesy of Jewish Foundation Fund; Photo Z. Kluger)

GEOMORPHOLOGY OF THE NEGEV HIGHLANDS



A: The *Small Makhtesh* from WSW. Note nearly horizontal stratification at upper, left side. (Author's photo)

Lamp A



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B

Lamp A

C: Reverse

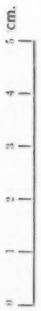
LAMPS WITH FISH RELIEFS

Lamp B

A

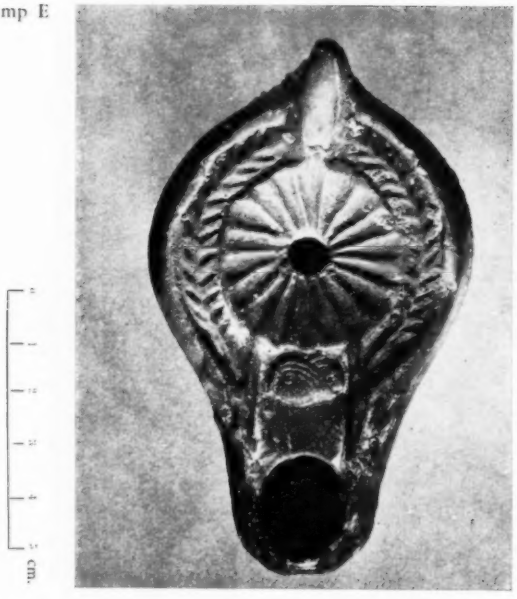
Lamp C

B: Detail



A: Lamp D

B: Lamp E



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